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CO-OPERATING WITH THE ELECTRICAL ENGINEER
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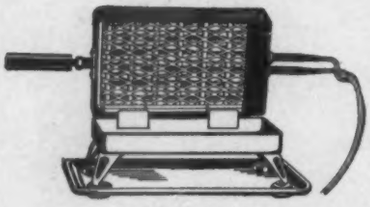

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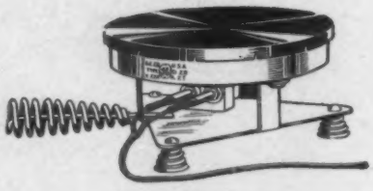

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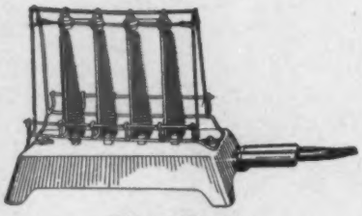

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THE WATER SUPPLY OF SAN FRANCISCO

BY M. M. O'SHAUGHNESSY.

(This timely article reviews the past history of San Francisco's efforts to obtain a municipal water supply and explains the means by which it is now proposed to accomplish this purpose. It is based on a talk recently given before the Engineers' Club of San Francisco. Mr. O'Shaughnessy is City Engineer for San Francisco.—The Editor.)

The city of San Francisco has been wrestling with the water problem since 1873 when they first attempted to acquire the supply then owned by the Spring Valley Water Company. Various efforts have since been made to acquire this property and the present city administration, headed by Mayor Rolph, has been endeavoring for two or three years to place the acquisition of the Spring Valley Water Company's system before the citizens.

There are many difficulties attending the supply of water to a city situated as San Francisco is, at the head of a very narrow peninsula to which water must be brought a considerable distance. Possibly the only other city comparable with San Francisco, and confronted with the same physical conditions, is New York, which is also at the head of a narrow peninsula. But New York is fortunate in having in its immediate vicinity a country with an average annual rainfall

Crystal Springs, Dam, Owned by Spring Valley Water Company.

of 45 in., whereas the average rainfall in San Francisco is less than 22 in. and therefore the conservation of large bodies of water in storage reservoirs to overcome dry periods is an imperative necessity in San Francisco. This condition, of course, also makes the delivery and distribution of water more expensive, the retail prices of water in San Francisco now averaging about $.21 a thousand gallons. This compares favorably with New York where the retail rates are $.16 a thousand gallons and where so far, they have gone only a comparatively short distance to get the present supply of 350,000,000 gallons per day. They are now constructing works 100 miles long to the Ashokan system to get an additional 500,000,000 gallons per day.

College Hill Distributing Reservoir.

Up to the time of the earthquake and fire, San Francisco was possibly the most prosperous municipality in the United States, having practically no bonded indebtedness. It, however, owned no public utilities such as a water supply, street railways, municipal docks or wharves, its only properties being schools, fire and sewer systems. Since that catastrophe, the city has been compelled to incur the enormous outlay of possibly $25,000,000 to $30,000,000. Restoring the destroyed streets cost about $8,000,000, restoring the sewer system and school and fire houses; puchasing a civic center; building a city hall; and constructing the high pressure fire fighting system, which cost $6,000,000 and is acknowledged by all critics to be the best in the world. This burden has been heavy and besides the catastrophe of fire and earthquake San Franciso also had the misfortune of being run by an undesirable lot of politicians, so that a house cleaning has had to take place, causing with factional conflicts a still heavier burden on the city.

The city, however, never lost sight of the necessity of acquiring a water supply. San Francisco is the only large city in the United States, with the exception of Denver, which does not own its own water supply. A city may get along without gas and electricity simply by using candles and coal oil lamps for light and wood and coal for fuel. If citizens do not like the street car system they may walk. But everybody needs water and the conservation of the water supply of a city is the most important duty of the citizens. The authorities are duly impressed with the great importance of solving this question, and besides making provision for the future water supply they are also endeavoring to make provision for the present immediate water supply. Considerable information on the general water problem can be had from the Freeman Report, and the author's report on City Wells.

Since the new charter of 1900 when water rates were reduced, the Spring Valley Water Company has made little extension to its system. It has ceased laying large distributing pipes through the city and the pipes now laid in the outlying district are less than 2 in. in dameter. In some portions of the city due to lack of water pipes, the condition is serious, such as in the Richmond section where a population of 40,000 people is fed by one 16 in. pipe. There are miles and miles of asphalt streets in that section with property worth hundreds of dollars per front foot dependent on one water service pipe. There are always two sides to every question. The claim of the citizens is that the water company has been charging too high rates. The water company's contention is that they have not been getting enough revenue; and possibly, there is always a middle ground which is the right ground, but

the practical result of this controversy compels the rate payers to pay the burden of legal expense annually incurred over rate contests.

In Washington last year, when the city's representatives were appealing to the national government to give the city the Hetch-Hetchy grant for a future source of supply, assurances were given Congress by the city officers that we propose to acquire the Spring Valley system. In pursuance of this policy, condemnation suit was filed against that company last December to acquire all of its property that was necessary and useful in connection with a future Sierra supply.

Lake Honda Reservoir.

With that end in view, and during the six months of last year I compiled a report at the request of the supervisors, delineating all the properties that were necessary for a municipal supply, and that included about one thousand acres of land in the city and county of San Francisco, and about 67,000 acres outside of the city. This list includes 823 acres around the shores of Lake Merced, and the latter, together with eleven other reservoirs shown on the various maps comprises the service reservoirs within the city. The list also includes all the lands, rights of way, pumping plants, and reservoirs in the country and are useful for a future supply. Certain lands have been excluded, such as the Coyote Creek and Searsville, which are positively of no value to the city, and the effect of excluding those lands has been to lower the purchase price of the Spring Valley properties so that the attorneys for the city were able to get the attorneys for the Spring Valley to agree to accept $34,500,000 for all the properties described in this condemnation suit. This is about $3,000,000 less than the price last demanded by the company. The company then asked $37,500,000, about eighteen months ago, and the city offered $37,000,000. Since that offer, about 30,000 acres of land have been excluded and the Spring Valley offered a portion of it to a water company in San Jose for about $150,000, but it is absolutely of no value to San Francisco for a future water supply.

Sixty-seven thousand acres of land outside of San Francisco has very substantial value—possibly $100 an acre is a fair average to put on it. Some of the lands inside of the city, such as the Ingleside tract of 43 acres, is worth at least $3000 an acre, as well as the sites of the University Mound, Holly Park, and Laguna Honda Reservoirs, so that the lands which the city is acquiring are of a very substantial value.

At the present time the water system is developed up to forty million gallons per day. About twenty million gallons is taken from the peninsula system of San Francisco, comprising the three reservoirs of Crystal Springs, San Andreas, and Pilarcitos with a combined capacity of thirty millions of gallons. The Crystal Springs dam can be increased at a moderate expense to nearly double its reservoir capacity by raising the dam about 50 ft. in height. The constructed portion of the dam is of sufficient base to be able to stand that raise without any great expense. The capacities of Alameda, Pleasanton, Calaveras and San Antonio sources are now twenty million gallons daily.

At the present time the company has under construction a hydraulically filled dam at Calaveras intended to be 200 ft. high. The base is about 1310 ft. wide and is now constructed, and an outlet culvert 20 ft. in diameter has been built to carry away the freshet waters so that the dam will not be destroyed during construction. The city practically assured the company a return on this item of outlay provided they went ahead and built this dam. About a year ago last August the Spring Valley started and made good progress until about January or February of this year. Since that time they have been proceeding slowly, due perhaps to the condemnation suit. If this proposed purchase is agreed upon the Spring Valley will probably proceed actively with the construction. Naturally, they are a timid corporation, susceptible to external influences. With the completion of the Calaveras dam, that reservoir with a capacity about equal to the combined capacity of all the three peninsula reservoirs, nearly thirty billion gallons, will add to the present supply about twenty million gallons a day more; so that with a comparatively moderate expense at least twenty-five million gallons per day can be taken out of the undeveloped portions of the Spring Valley.

The revenue list of 1912-1913 shows that the total revenue of the Spring Valley was $3,292,000, operating expenses $840,775 and taxes $116,000, making a total of $1,221,000, which makes a net revenue of $2,071,000 to meet interest on bonds, stock dividends, and depreciation. At $34,500,000 the proposed purchase price, on a basis of 4½ per cent the interest charge would be around $1,552,000 yearly, and deducting that from the net of $2,071,000 would leave $518,000 for a profit, including the depreciation. The depreciation may safely be estimated to be $250,000 to $300,000 a year on a plant of this magnitude, so that even at the present prices from the present figures and under city administration I believe a small profit can be made at the present sale price. I figure about $218,000 a year.

The entire distributing system of Spring Valley inside the city is about 568 miles, of which 424 miles, or 74 per cent is cast iron pipe which has been in for 22 years, 11 per cent is wrought iron riveted pipe which has been in for 27 years, and 133 miles small pipe with an average of 10 years, which confirms my statement that the policy of the Spring Valley for the past ten years has been to put in very small pipes so as to get the commodity to the consumer at a minimum of expense and defer capital expenditure for larger pipe. Of course, this situation would be changed under a city ownership, as the city would put in pipes of a larger diameter, none less than 6 or 8 inches, and map out a more generous policy toward consumers.

There are two alternatives at hand for the city. One is to buy Spring Valley and the other is to cease all negotiations and go ahead at once with the complete construction of the Hetch-Hetchy system All estimates, including Mr. Freeman's, figure about $40,000,000 to the city boundary line and with the necessary distributing reservoirs, land, pipe lines, and pumping stations, inside the city, will cost $12,000,000 or $14,000,000 more, making $54,000,000 or $55,000,000 for the water supply and its delivery to the consumers in the city, exclusive of interest during construction.

If this alternative is adopted the city will have to pay interest on the entire $55,000,000 until the day of first delivering water. Eighty thousand taps now exist and the change from the private company to the public company will be slow and prolonged and there will be a tremendous economic waste during the transition.

The policy of the city administration is, however, a broad one; and it is endeavoring to solve this question on its business merits and treasure no resentment on account of past controversies .

The plan is to acquire the company for about $34,500,000, spending about $8,000,000 on the completion of the Calaveras dam and advancing construction towards the Hetch-Hetchy system, reducing the total cost and gradually developing the present system. Forty millions of gallons is to sixty-five millions of gallons as $3,200,000 is proportioned to $5,200,000 so that the purchase of this system on this plan and developing it progressively, using receipts from sales of water, will make no burden on the taxpayers of San Francisco. In the meantime the city will proceed to develop the mountain water supply, build the Hetch-Hetchy dam, twenty miles of aqueduct and develop 30,000 h.p. as a first unit of hydroelectric power which will help to operate municipal railways. The whole purpose of this policy is to keep the tax rate down and help acquire other public utilities and proceed in a sound and reasonable manner with the financial policy of the city.

The tax rate in San Francisco is $2.30 on a fifty per cent valuation; Los Angeles, $3.19; Oakland, $2.97; San Diego, $3.95; Sacramento, $4.17; Pasadena, $3.90; Stockton, $4.04. In fact, the tax rate of San Francisco is but one-half of what it is in the other cities of the state. This will show that, notwithstanding our political administration, San Francisco is handling its business matters in a sound manner.

A world's record in freight haulage is claimed to have been set by the new "centipede" locomotive of the Erie railroad which pulled 250 fully loaded cars at the rate of 15 miles per hour. The locomotive weighs 410 tons and has 24 driving wheels.

California's hydroelectric power development ultimately possible is entimated at six and one-half million horsepower, three-fourths of which lies within the national forests and is consequently subject to federal control. Of the half million horsepower already developed more than one-third of the developments have conduits or power house sites entirely or in part on government land within national forests.

The Oregon Hydroelectric Commission's request that the U. S. Consular service collect data concerning the development of foreign hydroelectric enterprises, has been granted. H. B. Miller, chairman of the commission, has received copies of a letter being sent to all American consular officers. The outline calls for detailed reports of equipment, costs, operating statistics, rates, power uses, and government ownership and control.

COMPARISON OF STEAM AND DIESEL UNITS.

(The comparative data in this article were brought out in an investigation of the Arizona Corporation Commission into the advisability of allowing the Bisbee-Naco Water Company to issue notes to pay for a Diesel engine electric installation to replace steam pumping units.—The Editor.)

The equipment now installed at the Naco pumping plant of the Bisbee-Naco Water Company consists of steam boilers, triple expansion high duty steam pumps, Prescott duplex steam sinking pumps, Diesel type oil engines, quintuplex high duty surface pumps and triplex deep well pumps; the Diesel engines being direct connected to the generators and the quintuplex and triplex pumps motor driven. The Prescott steam sinking pumps are rarely operated, but are held in readiness for operation. The steam sinking pumps are not prime operating units since they are not used normally when other steam units are in service. Consequently this equipment may be divided into two general classes—steam operating equipment and Diesel oil engine equipment.

The duty required of the plant consists of pumping water from wells to surface reservoirs and pumping from surface reservoirs to the several storage tanks in and around the cities of Bisbee, Warren, Lowell, Naco, Arizona, and Naco, Sonora.

Since the operating equipment may be divided into two general classes and the functions to be performed into the same, an analysis of operating costs resolves itself into the following:

1. A determination of the amount of work performed by each of these classes of machinery.
2. Ascertaining the unit cost of such work.
3. A comparison of the efficiency of these classes as installed at this plant.
4. Recommendations relative to improving efficiency and reducing operating costs.

In such analysis it is necessary to tabulate and arrange the records of past operations, using the best data available, and in all cases the greatest period of time applicable and presented in evidence herein will be used.

Work Done by Each Class of Equipment.

The data available for this consideration is that shown in the reports from April 1st to November 1st, 1913, tabulated below:

Tabulation of Hours Operating for Steam and Diesel Classes From April 1st to November 1, 1913.

		Operating.			
Month.	Total Hours.	Steam Hours.	Per Cent.	Diesel Hours.	Per Cent.
April	720	121	16.8	599	83.2
May	744	26	3.5	718	96.5
June	720	105	14.5	615	85.5
July	744	189	25.5	555	74.5
August	744	16	2.4	728	97.6
September	720	20	2.8	700	97.2
October	744	10	1.4	734	98.2
November	720	95	13.0	625	87.0
Totals	5856	582		5274	
Average	732	72.8	10.00	659.2	90.0

From this, it is observed that the steam units were in operation ten and the Diesel units ninety per cent of the total time. It has been represented that the above time period does not cover the months for general repairs of the Diesel units for this year, this being done twice a year and being for a longer period than any shown in the tabulation. Considering the time covered in the tabulation as compared with the total life of the Diesel units, the tabulation covering but a small part of the life of the Diesel equipment, the commission feels that the percentages as here given are above the normal for the life of these machines, and for this item uses 14 per cent for time of steam units operating and 86 per cent for time of Diesel operation, or 314 days Diesel operation and 51 days steam operation per year.

Unit Cost of Work Done by Each Class of Equipment.

The large items entering into a consideration of the unit costs of operating these classes of equipment are:

Fuel operating;
Labor operating;
Labor maintenance;
Material maintenance.

From the reports made at this plant, and under the system of accounting in vogue prior to the uniform classification of accounts for water companies issued by this commission, it has not been possible to secure many data regarding the cost of any of these items excepting fuel cost.

However, from a study of these reports and the conditions at the Naco plant relative to labor required and material used when operating either class it appears that the labor operating cost is not materially altered by a change from one class to the other, nor is there a material increase or decrease in the two last items when changing from one class of operating units to the other.

For these reasons only fuel costs will be considered for unit cost of operation, it being found that a large part of the difference in the cost of operating these two classes of machinery is in the fuel item.

To arrive at such unit cost of operation, it was necessary to tabulate the total oil consumption, showing the amount and percentages used by each class per year. This table follows and covers a period of 4-5/12 years:

Tabulation of Oil Used for Steam and Diesel Operation From July 1, 1909, to December 1, 1913.

Year.	Total Gals. Used.	Boilers, Gals.	Per Cent.	Diesel Gals.	Per Cent.	Remarks.
1909	50,767	16,729	33.0	34,038	67.0	Last ½ yr.
1910	114,846	48,227	42.0	66,619	58.0	
1911	139,167	87,846	61.4	53,321	38.6	
1912	414,270	358,944	86.6	55,326	13.4	
1913	290,224	229,118	79.0	61,606	21.0	1st 11 mos.
Totals	1,009,774	738,864		270,910		
Averages, 4 5/12 years	227,083	167,158	73.8	61,292	26.2	

The percentages of fuel oil used by these two classes of equipment for 4-5/12 years were: For steam 73.8 per cent and for Diesel 26.2 per cent.

Considering the condition of the oil market at this time and the ascending cost of this commodity during the last five years, the present price of four cents was assumed for oil. In such instance the total cost of fuel per year for the two classes, from the above average, was:

167,158 gals. @ 4c. per gal.—For steam operation, one year $6,686.32

61,292 gals. @ 4c. per gal.—For Diesel operation, one year $2,451.68

For the cost per unit of work done, referring to the percentage of work performed by each class, $6686.32

is cost of 14 per cent, and 1 per cent of power made by steam units is $477.60: $2451.68 is cost of 86 per cent, and 1 per cent of power made by Diesel units is $28.51. This gives a ratio of fuel efficiency of Diesel to steam units of 1 to 16.75.

This is much above normal for these two classes and is caused by the heavy repairs to wells in 1912 and construction during the early part of 1913. For this reason, considering the most favorable year regarding fuel consumption thus:

48,227 gals. @ 4c. per gal.—For steam operation, 1910 ..... $1,929.08

66,619 gals. @ 4c. per gal.—For Diesel operation, 1910 ..... $2,664.76

And using the same percentages of time operated or duty performed, $1929.08 is cost of 14 per cent, and 1 per cent of power made by steam units is $137.74; $2664.76 is cost of 86 per cent, and 1 per cent of power made by Diesel units is $30.98, thus giving a ratio of fuel efficiency of Diesel to steam units of 1 to 4.45.

Averaging this ratio for the best year with that obtained for 4-5/12 years, the ratio of fuel efficiency of Diesel to steam units at this plant is 1 to 10.6, which is above the ratio obtained in other plants operating modern steam and Diesel units. Considering the fact that some of the steam equipment is inefficient and not to be compared with present manufacture, and considering carefully the testimony and evidence presented the commission believes that a safe ratio of efficiency for steam and Diesel units of this plant under careful operation to be as 1 to 8. Accordingly this calculation was used.

Comparative Annual Cost of Operating.

From an investigation of the amount of oil used per day under boilers during 1913, it was found that the average daily consumption of oil per boiler has been 750 gallons. It was also ascertained that during the operation of boilers for the period, one and one-half boilers were used for the total time of boiler operation. This gave a daily oil consumption for boilers of 1125 gallons, which for 14 per cent of one year, or 51 days, gave 67,375 gallons, costing, at 4 cents per gallon, $2695.00. To this add the cost of packing the surface steam pumps, which was often above normal on account of hardening during non-use, this cost per year being $252.

From the total of above items, deduct the cost of fuel oil for 51 days for Diesel operation, which from data for the year 1913 was one-eighth of steam, or $336.80. Or recapitulatiing:

Cost of fuel for 51 days of steam operation.	$2,695.00	
Cost of packing steam pumps, excess of normal	252.00	
Cost of fuel oil for Diesel operation, 51 days at 1/8th of steam		$336.80
	$2,947.00	$336.80

This demonstrated a saving in fuel operating costs per year, if Diesel units replace steam units 14 per cent of time, of $2610.20. This saving is in fuel oil for operating only.

One of the most important points for consideration in this report is the effect of the heavy duty required of present Diesel equipment. On account of the low efficiency of the steam units as compared to the Diesel units, a comparatively short period of operating the former increases the cost of operations at Naco to an extent exceeding the allowance for this particular item, and it has been found necessary on account of such steam costs to operate the Diesel equipment to its limit.

The load is not excessive, but because there is but one large Diesel engine capable of carrying the normal load this engine is operated as near 365 days in the year as possible. It is such continuous operation without small needed repairs that is shortening the life of this machine and will be given consideration here.

It was necessary to operate at Naco 24 hours per day. Twelve hours has been found to be the maximum time that pumps could be idle and maintain a sufficient supply in the service tanks.

Under present conditions, only small repairs could be made on the Diesel engines without firing the steam boilers.

This explained the heavy duty required of the engine, and, in the opinion of the engineers, this continuous operation will shorten the life of the unit at least three years. If this be true, assuming the normal life of this class of machinery to be fourteen years and the first cost $22,000.00, the loss on this unit due to excessive wear was for the fourteen years prorated, $1560 per year, and for three years shortened life, $4680.

This applied to the cost of equipment to replace the steam units, prorating per year using fourteen years as the life of a new engine, would be $334.30 per year, and should be added to the economies by the installation of another Diesel engine.

A resume of the facts presented demonstrated that by the addition of another large Diesel power unit, a total saving of $2944.50 can be effected, and the efficiency of the plant increased.

Electric power on the Witwatersrand, South Africa, according to statistics compiled by the South African Institute of Electrical Engineers, aggregates about 220,000 kw. Most of the power is generated at 50 cycles, though several of the mines generate 25-cycle power. Of this amount 43,210 h.p. are required by 406 motors for underground pumping 21,100 h.p. by 78 motors for underground hoisting, 70,321 h.p. by 112 motors for surface hoisting, 8330 h.p. for stamp-milling, 31,468 h.p. for tube-milling, 47,894 h.p. for cyanide and reduction processes, 30,105 h.p. for electrically-driven compressors, and 2865 h.p. for ore sorting, crushing, haulage, etc. Most of the power is alternating current.

The longest power line in the world is now that of the combined transmissions of the Southern Sierra Power Company and the Holton Power Company. The first extends 238 miles from Bishop Creek to San Bernardino, California, and the other 166 miles from San Bernardino to El Centro, California, a total distance of 404 miles at 140,000 volts. Work has just been completed on the new line, and Sierra power is now being delivered to the Imperil Valley by means of substations at Banning, Coachalla, Calipatria and El Centro.

ELECTRIC DISTRIBUTION

STANDARDS IN SAN DIEGO.

BY L. M. KLAUBER.

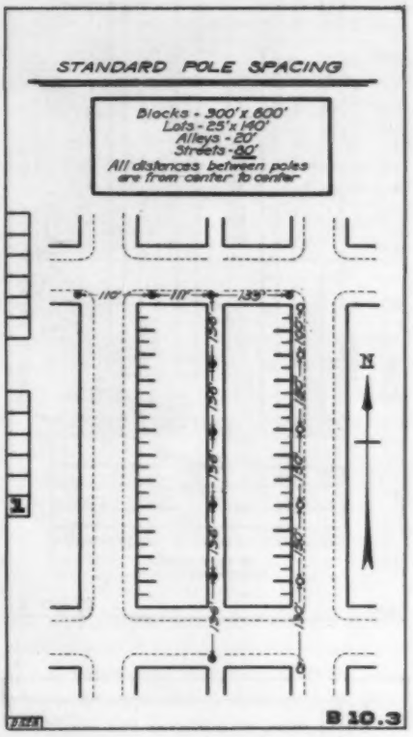
(The second instalment of Mr. Klauber's articles is concerned with pole-spacing and standard materials, including poles, cross-arms, wires and cables, fuses, potheads, iron conduit, anchors and hardware.—The Editor.)

B. Standard Pole Spacing.

Standard block layouts should be made for each district. As can be noted from the typical diagram shown, the data indicated include the size of blocks and lots, the width of alley (if any), the width of street, the pole-distance on north-and-south, and east-and-west streets, and the pole spacing in alleys. This information should be shown for each variation in city layout.

Stakes for poles, in street where curb is not in, are set 14 in. back from future curb line. Stakes set in alleys are placed 12 in. out from property line. All stakes are set in the center of proposed pole position.

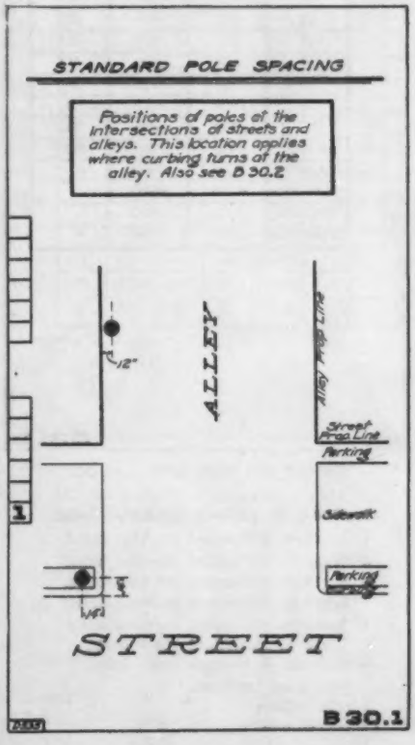
Positions of poles under several conditions are shown in diagrams.

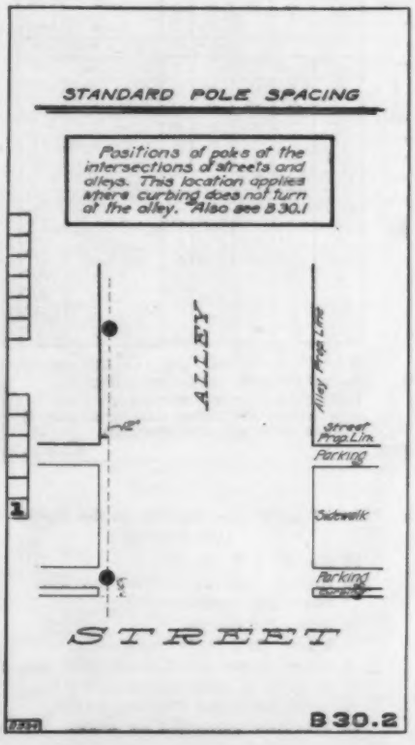


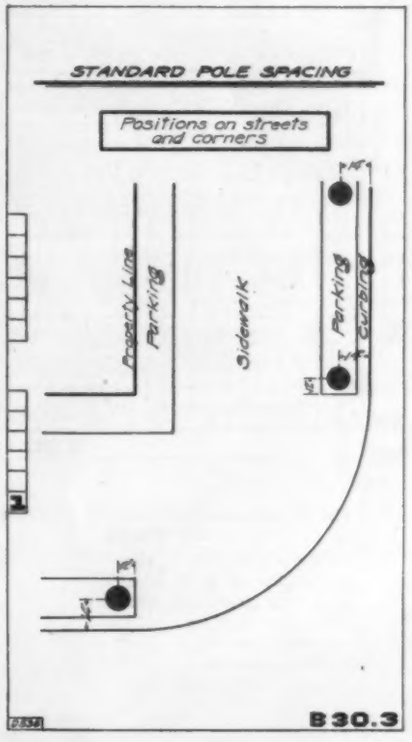
POLE WEIGHTS.

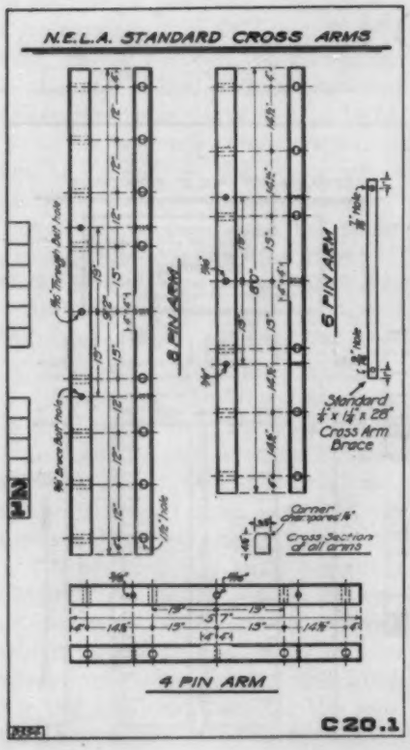
Approximate Weights of Cedar Poles for Figuring Truck Loads.

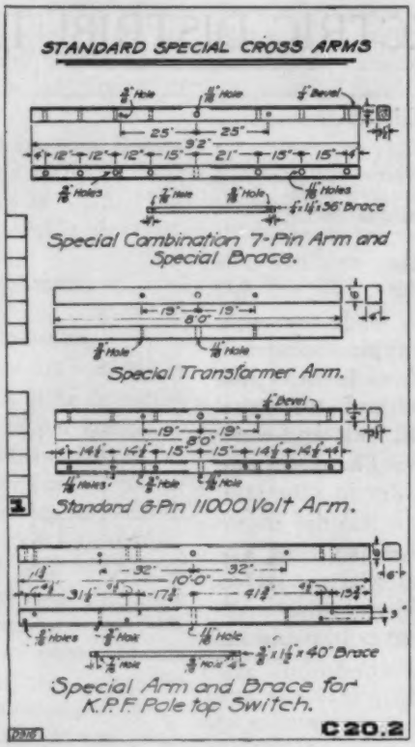
Length of Pole.	Top, Inches.	Weight, Lbs.
25	6	250
25	7	300
25	8	350
30	6	350
30	7	450
30	8	600
35	6	525
35	7	625
35	8	775
35	9	900
40	7	850
40	8	1050
40	9	1200
45	8	1250
45	9	1350
50	8	1500
50	9	1650
55	8	1600
55	9	1800
60	8	1500
60	9	2000

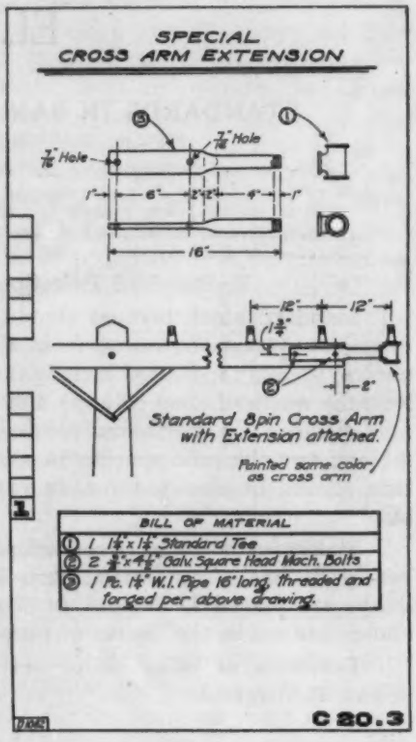



STANDARD POLE SPACING
Positions of poles at the intersections of streets and alleys. This location applies where curbing does not turn at the alley. Also see B 30.1
ALLEY
Alley Prop. Line
Street Prop. Line
Parking
Sidewalk
Parking
STREET
B 30.2






STANDARD SPECIAL CROSS ARMS
Special Combination 7-Pin Arm and Special Brace.
Special Transformer Arm.
Standard 6-Pin 11000 Volt Arm.
Special Arm and Brace for K.P.F. Pole top Switch.
C20.2


SPECIAL CROSS ARM EXTENSION
Standard 8pin Cross Arm with Extension attached.
Painted same color as cross arm
BILL OF MATERIAL
1 1¼" x 1¼" Standard Tee
2 ⅜" x 4½" Galv. Square Head Mach. Bolts
1 Pc. 1¼" W.I. Pipe 16" long, threaded and forged per above drawing.
C20.3

WIRE DATA

SIZE	CIRCULAR MILS	OHMS PER 1000 FT. AT 75° F.	BARE D.B. WEATHERPROOF DIA. INCHES	BARE D.B. WEATHERPROOF LBS. PER 1000 FT.	BARE D.B. WEATHERPROOF CAPACITY AMPS.	D.B. RUBBER COVERED DIA. INCHES	D.B. RUBBER COVERED LBS. PER 1000 FT.	D.B. RUBBER COVERED CAPACITY AMPS.
SOLID CONDUCTOR								
14	4,107	2.5266	.064	12.44	30	.156	20	20
12	6,530	1.5890	.081	19.77	40	.172	30	25
10	10,382	.99948	.102	31.44	55	.205	46	30
8	16,510	.62849	.128	49.99	75	.250	66	50
6	26,250	.39536	.162	79.49	105	.296	100	70
4	41,743	.24856	.204	126.40	145	.328	151	90
2	66,373	.15635	.258	200.98	200	.390	239	125
0	105,592	.09827	.325	318.74	260	.468	377	200
00	133,079	.07797	.365	402.97	300	.508	477	225
000	211,600	.04904	.460	640.75	445	.609	725	325
STRANDED CONDUCTOR								
0	105,625	.09948	.375	322	345	.578	308	200
00	133,225	.07887	.420	406	410	.625	482	225
000	211,600	.04966	.470	645	360	.687	745	325
0000	250,000	.04205	.530	762	630	.750	907	350
—	300,000	.03502	.590	915	730	.796	1085	400
—	350,000	.03002	.630	1068	815	.843	1248	450
—	400,000	.02627	.728	1220	910	.906	1436	500
—	500,000	.02101	.813	1525	1090	1.000	1765	600

SIZE	D.B. RUBBER COVERED DIA. INCHES	D.B. RUBBER COVERED LBS. PER 1000 FT.	D.B. RUBBER COVERED CAPACITY AMPS.
14	.258	40	15
12	.275	52	20
10	.296	67	25
8	.322	92	35
6	.367	142	50
4	.457	209	70
2	.511	297	90
0	.649	474	125
00	.669	564	150
000	.784	855	225
0	.697	494	125
00	.749	595	150
000	.851	879	225
0000	.929	1047	257
—	.986	1226	275
—	1.036	1395	300
—	1.085	1573	325
—	1.171	1908	400

C30.1

VARNISHED CAMBRIC INSULATED LEAD COVERED CABLES.

DIMENSIONS AND STOCK CARRIED.

SIZE	MIN. STOCK FT.	ORDER FT.	INSULATION. *	LEAD *	APPROX. DIA. OVER ALL. INCHES	CARRY. CAP. AMPS.
SINGLE CONDUCTOR, 600 VOLT SERVICE						
8†	†	†	4	5	.410	45
6†	300	600	4	5	.443	61
4†	300	600	4	5	.485	83
2	300	600	4	5	.573	113
0	300	600	5	5	.688	155
00	†	†	5	5	.733	178
0000	300	600	5	5	.843	242
TWIN CONDUCTOR FLAT, 2300 V. SERVICE						
8	150	500	8	6	.583 x .980	39
6	150	500	8	6	.621 x 1.055	55
4	†	†	8	6	.669 x 1.151	71
2	150	500	8	6	.729 x 1.271	97
0	150	500	8	6	.813 x 1.438	131
00	†	†	8	7	.890 x 1.560	152
0000	400	400	8	7	1.000 x 1.780	207
THREE CONDUCTOR ROUND, 2300 V. SERVICE						
8	150	500	4x4	6	.895	39
6	150	500	4x4	6	.976	53
4	150	500	4x4	6	1.078	71
2	150	500	4x4	6	1.210	97
0	150	500	5x4	7	1.486	131
00	†	†	5x4	7	1.583	152
0000	†	†	5x4	7	1.820	207

* Insulation and Lead thickness in 64ths of one inch.
† Solid Conductor - All others Stranded.
‡ Not ordinarily carried in stock.
Single Conductor No 4 2300 Volt Cable carried in stock for transformer, pot head and cut out connections.

C31.1

VARNISHED CAMBRIC INSULATED LEAD COVERED CABLE

ALLOWABLE CONTINUOUS CARRYING CAPACITY IN AMPERES

SIZE	SINGLE COND. LOW VOLTAGE (600 V.)	SINGLE CONDUCTOR 2300 V.	TWO COND. OR THREE COND. 2300 V.
10	34	35	29
8	45	48	39
6	61	65	53
4	83	88	71
2	113	119	97
0	155	161	131
00	178	189	152
0000	242	256	207
300,000	304	320	
500,000	425	448	
750,000	555	580	
1,000,000	670	705	

C31.2

List of Extra Service Material to Be Carried by Line Wagons.

25 lbs. No. 10. W. P. wire.
25 lbs. No. 8 W. P. wire.
6 2½-in. glass strain insulators.
2 straight brackets.
3 curved brackets.
10 No. 3 screw eyes.
2 3-pin service buck arms.

List of Extra Line Material to Be Carried by Line Wagons.

50 lbs. No. 6 W. P. wire.
200 ft. ¼-in. galvanized strand guy wire.
2 2-bolt guy clamps.
6 3-bolt guy clamps.
2 3¼-in. glass strain insulators.
6 3½-in. brown porcelain strain insulators.
12 D. G. D. P. glass insulators.
6 28-in. galvanized cross-arm braces.
12 ½x3½-in. galvanized lag screws.
12 ⅜x4½-in. galvanized machine bolts.
3 ⅝x10-in. galvanized machine bolts.
6 ⅝x12-in. galvanized machine bolts.
6 ⅝x14-in. galvanized machine bolts.
6 ⅝x16-in. galvanized machine bolts.
4 ⅝x18-in. galvanized machine bolts.
6 ⅝x18-in. galvanized space bolts.
6 ⅝x20-in. galvanized space bolts.
2 lbs. ⅝-in. Washers.
4 pole collars.
12 Locust pins.

LOW TENSION FUSES
STANDARD SIZES CARRIED IN STOCK

SIZE AMPERES	250 VOLT SERVICE: EDISON PLUG CUTOUTS	250 VOLT SERVICE: CARTRIDGE FERRULE	250 VOLT SERVICE: CARTRIDGE KNIFE	600 VOLT SERVICE: CARTRIDGE FERRULE	600 VOLT SERVICE: CARTRIDGE KNIFE
3				●	
5				●	
6	●	●			
10	●	●		●	
15	●	●		●	
20	●	●		●	
25	●	●			
30	●	●		●	
35		●		●	
40		●		●	
50		●		●	
60		●		●	
65			●		●
75			●		●
100			●		●
125			●		●
150			●		●
200			●		●
250			●		●
300			●		●
400			●		●
500			*		*
600			*		*

Carried in stock ● Ordered as required *

Double Lines enclose groups of like sizes which will fit the same fuse blocks.

C 40.1

HIGH TENSION FUSES.
STANDARD SIZES CARRIED IN STOCK

SIZE AMPERES	2300 VOLT SERVICE: STANDARD OPEN LINK FUSES FOR TRANS. CUT-OUTS	2300 VOLT SERVICE: CARTRIDGE KNIFE FUSES FOR POWER BOXES	2300 VOLT SERVICE: FUSE WIRE FOR USE IN OIL FILLED SUBWAY CUTOUTS	11000 VOLT SERVICE: STANDARD OPEN LINK FUSES FOR TRANS. CUTOUTS	11000 VOLT SERVICE: SHORT OPEN LINK FUSES FOR LIGHTNING ARRESTERS
1	●			●	●
2	●			●	
3	●			●	●
5	●			●	●
8				●	
10	●	●	●	●	●
12				●	
15	●	●	●	●	
20	●	●	●	●	
25	●	●	●		
30	●	●	●		
40		●	●		
60		●	●		
75		●	●		
100		●	●		

Dots show fuses carried in stock.

Do not make fuses of large size by twisting two small ones together.

C 40.2

POTHEADS
STANDARD TYPES FOR USE ON UNDERGROUND WORK

NO.	TYPE	MFG.	VOLTS	AMPS.	CABLE SIZE	HLS.	DISCONNECTING
10	S	G&W	6600	100		1	Yes
13	S	"	"	175		1	"
20	TS	"	"	600		1	"
30	O	"	"		600,000	1	No
81	LS	"	"		1/0	2	Yes
83	LS	"	"		1/0	3	"
91	LTS	"	"		6/0 up	2	"
93	LTS	"	"		6/0 up	3	"
391	39	EEE	13200		2 1/2"	2	No
371	37	"	"		2 1/2"	3	"
104	10	"	"		3 1/2"	2	"
105	10	"	"		3 1/2"	3	"

NO.	CONSTRUCTION USES
10	2300 V. Manhole disconnectives. Branch line.
13	" " " Main line.
20	" " " Extra heavy.
30	Cable Poles. 300 V. D.C. System.
81	2300 V. Cable Pole disconnectives. 2 Pole.
83	" " " " 3 Pole.
91	" " " " 2 Pole. Heavy.
93	" " " " 3 Pole. Heavy.
391	Cable Pole non-disconnecting. Plant.
371	" " " "
104	Interior Service.
105	" "

C 50.1

CONDUIT DIMENSIONS
STANDARD BLACK ENAMELED OR SHERADIZED

STAND. SIZE PIPE	INTERNAL DIA. INCHES	OUTSIDE DIA. INCHES	NUMBER THREADS PER INCH OF SCREW	NOMINAL WT. PER FT. LBS.	ELBOWS WT. PER 100 LBS.	COUPLINGS WT. PER 100 LBS.
1/4"	.36	.54	18	.40		
3/8"	.49	.67	18	.53		
1/2"	.62	.84	14	.85	73	15 1/2
3/4"	.82	1.05	14	1.12	132	25 1/2
1"	1.05	1.31	11 1/2	1.67	200	40 1/2
1 1/4"	1.38	1.66	11 1/2	2.24	300	57 1/2
1 1/2"	1.61	1.90	11 1/2	2.68	415	71 1/4
2"	2.07	2.37	11 1/2	3.61	700	132
2 1/2"	2.47	2.87	8	5.74	1138	185
3"	3.07	3.50	8	7.54	1885	300
3 1/2"	3.55	4.00	8	9.00	2100	400
4"	4.03	4.50	8	10.66	2160	412
4 1/2"	4.50	5.00	8	12.49		
5"	5.04	5.56	8	14.50		
6"	6.06	6.62	8	18.76		

C 60.1

CONDUIT TABLE

SIZE OF WIRE	1 WIRE: SHORT RUN	1 WIRE: MEDIUM RUN	1 WIRE: LONG RUN	2 WIRES: SHORT RUN	2 WIRES: MEDIUM RUN	2 WIRES: LONG RUN	3 WIRES: SHORT RUN	3 WIRES: MEDIUM RUN	3 WIRES: LONG RUN
14	3/8	3/8	1/2	1/2	1/2	3/4	1/2	3/4	1
12	3/8	3/8	1/2	1/2	3/4	3/4	3/4	3/4	1
10	3/8	3/8	1/2	1/2	3/4	3/4	3/4	1	1
8	3/8	3/8	1/2	3/4	3/4	1	1	1 1/4	1 1/4
6	1/2	1/2	3/4	1	1	1 1/4	1	1 1/4	1 1/4
4	1/2	3/4	3/4	1	1 1/4	1 1/4	1 1/4	1 1/4	1 1/2
2	1/2	3/4	1	1 1/4	1 1/2	1 1/2	1 1/4	1 1/2	2
1	1/2	1	1	1 1/4	1 1/2	2	1 1/2	2	2
0	3/4	1	1	1 1/2	2	2	2	2	2
00	1	1	1	1 1/2	2	2	2	2	2
000	1	1 1/4	1 1/4	2	2	2	2	2 1/2	2 1/2
0000	1	1 1/4	1 1/4	2	2	2 1/2	2	2 1/2	3
300,000	1 1/4	1 1/2	1 1/2	2	2 1/2	2 1/2	2 1/2	3	3
400,000	1 1/2	1 1/2	2	2 1/2	3	3	3	3	3 1/2
500,000	2	2	2 1/2	3	3	3 1/2	3 1/2	3 1/2	4
700,000	2	2 1/2	2 1/2	3	3 1/2	4	4	4	4 1/2
1,000,000	2	2 1/2	3	4	4	4 1/2	4 1/2	4 1/2	5

SHORT RUN - Not over 150 ft. and having only 1 or 2 bends of a radius not less than 5 ft.

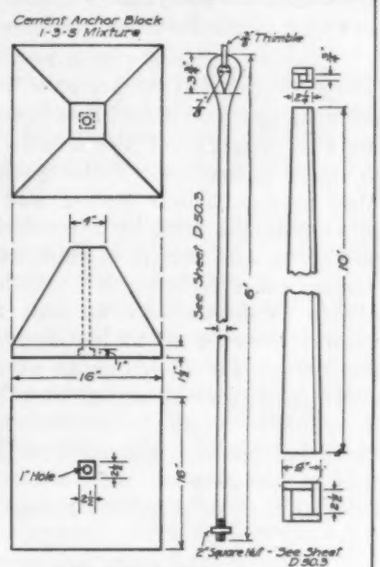
MEDIUM RUN - Not over 150 ft. and having not more than 3 or 4 easy bends; or, 250 ft. long and nearly straight; or, short run with 1 close and 1 or 2 easy bends.

LONG RUN - Over 150 ft. with close or medium bends; or, a run with more than 1 close bend; or, any run with an extra close bend.

No conduit smaller than 1/2" is permitted for electric light wiring, but 3/8" noted above is sometimes used for signal work.

C 60.2

STANDARD CEMENT ANCHOR, ROD AND BOX



BILL OF MATERIAL
1 Cement Anchor
1 3/4" x 6' Anchor Rod
1 10' Anchor Box

C 70.1

Common Wire Nails and Spikes.

Size.	Length, Inches.	Diameter, Inches.	Number Per. Lb.
2d	1	.072	876
3d	1 1/4	.080	568
4d	1 1/2	.099	316
5d	1 3/4	.099	271
6d	2	.113	181
7d	2 1/4	.113	161
8d	2 1/2	.131	106
9d	2 3/4	.131	96
10d	3	.148	69
12d	3 1/4	.148	63
16d	3 1/2	.162	49
20d	4	.192	31
30d	4 1/2	.207	24
40d	5	.225	18
50d	5 1/2	.244	14
60d	6	.263	11

Dimensions of Screws.

Trade No.	Diameter, Inches.	Nearest B. & S. Gauge.	Greatest Length.
0	7/128	15	3/8
1	9/128	14	1/2
2	5/64	12	7/8
3	3/32	11	1 1/2
4	7/64	9	1 1/2
5	1/8	8	2 1/2
6	17/128	7	3
7	19/128	7	3
8	5/32	6	4
9	11/64	5	4
10	3/16	5	4
11	13/64	4	4
12	27/128	4	6
13	29/128	3	6
14	15/64	3	6
15	1/4	2	6
16	7/64	2	6
17	9/32	1	6
18	19/64	1	6

ELECTRICAL CONTRACTORS' DEPARTMENT

CO-OPERATING WITH THE ELECTRICAL ENGINEER.

BY F. B. HUNTER.

(After showing the dependence of civilization upon manufactured power, the author shows how the contractor can co-operate with the engineer in correcting the faults now found in specifications. This was presented as a paper at the recent meeting of the California Association of Electrical Contractors at Sacramento.—The Editor.)

Contractors, jobbers, manufacturers, engineers and architects all wish to improve conditions, but progress is hindered in many cases by mutual distrust and by a lack of knowledge of the best way to make the change. A fuller understanding of the relationship of all parties, and a mutual endeavor to help one another will soon pave the way for a better undestanding and solution of the problems confronting us.

The present generation has seen the rise of entirely new professions; early in the present age the recognized professions were divided into two classes—military and civil. In civil life, divinity and medicine were the recognized divisions. The demands of advancing civilization have added to these. Engineers were needed to develop, design and "direct the great sources of power in nature for the use and convenience of man," and the contractors to carry out these works and so bring to all the benefits of the new age.

I speak advisedly of a new age as I believe you will all agree that we are now living in a well defined ethnical age. You are all familiar with the epochs marking the progress of the human race from savagery through barbarism to the present day civilization. Man in the earliest period was on a level with the other animals, until by the discovery of fire, the bow and arrow and the art of manufacturing iron he placed himself on a higher plane. Along with this came his ability to domesticate animals and by directing the animal power then at his disposal, supplemented by the use of the instruments of iron, he was able to accomplish greater works than he could before these discoveries. With the invention of the written alphabet primitive man passed from barbarism to civilization, in that he made the work of one set of men available for the study by others and so made co-operation feasible.

Subsequent periods are not so well defined, possibly because they are so close to the present, but through all of this man's accomplishments were limited to his own individual exertions and those of the animals whose efforts he could control and direct. His capacity is now no longer so limited, as he has learned to manufacture power and this marked the beginning of a new period in his history, the one in which we are now living, the age of manufactured power.

I do not believe that we have reached the limits of our achievements in the utilization of Nature's forces. It was not the invention of the first engine, but the general control of manufactured power and its adaption to the needs of man which is now advancing us to a higher civilization. While water wheels, steam engines, in their various forms, and internal combustion engines are the present day sources, new forms may come at any time. These are, however, relatively unimportant, as the great civilizing force was the ability to manufacture power at all, and the method is comparatively a secondary consideration.

Evidences are already before us of the near solution of the great problem of the control of molecular forces, the forerunner of which is radium and its allied substances. Whether this will mark another epoch in man's development or be merely considered a part of his age of manufactured power will have to be left to future generations. Probably it will be considered only a part of the development of manufactured power and the engines for their utilization will be classed with the water wheels, steam engines and others marking the development of the art. In reality this is only the conversion of another of Nature's great sources of power.

The effect of man's discovery that he could manufacture power is so wide reaching that it is foolish to prophecy. Discoveries in the past may soon be considered trivial in comparison with those to come in the near future. Our problem is to secure for present generations the greatest good from the application of manufactured power which is now, due to our ability to convey it electrically, available at any time and place that may be desired. To secure this result in the most economical way requires co-operation.

The co-operation of the electrical engineer and the electrical manufacturer has resulted in the marvelous development of the present day electrical apparatus. This is not alone confined to the machinery for the conversion of power but extends to the appliances for the use of the power manufactured by our friends of the central stations. This development is not at a standstill by any means and the builders are really only safe when they delay the letting of their electrical contracts until the last minute, if they wish to secure the latest and most improved appliance. In the last six months we have revised the wiring plans of two large buildings in order to take advantage of new devices that were brought to perfection while we were making the original plans. Both of these resulted in large savings in the cost and show the rapidity with which the co-operation of the electrical engineer and the manufacturer is developing new appliances and devices.

We now have the appliances and tools to make the present day homes and places of business more comfortable and convenient than our grandfathers ever dreamed of. Our great problem is to introduce them and to do this in a way to insure their successful and economical installation and operation.

The answer to this is again co-operation, co-operation between the architect, engineer, contractor and manufacturer. The owner through his architect provides in his building for all the conveniences and comforts they know of, but due to the highly complex nature of a modern building, very few architectural offices are equipped to study and keep abreast of the developments in the electrical, sanitary and mechanical fields.

It is unfortunate that many people believe that once a specification has been used for some one build-

ing all that is necessary to do is to change the name of the building as written in the specification and the work for the succeeding ones is done. You are all familiar with the results that follow and usually the contractor is the one to bear the blame because the job cannot be completed without a nice large bill for extras. Many of course do not seriously object to this but I am sure that all of you would rather have a well defined, clear cut, detailed set of plans and specifications to work to rather than the vague, ill adapted and incomplete tools which you get under this system.

This is getting a little ahead of the chronological sequence of events, for your troubles really start before you get the contract. In fact, they begin when you start to estimate the work and make your bid. You know perfectly well what should go in. The question is will your competitor figure on the same thing or will he use something cheaper and hope to have it passed, or will leave out the things that are vaguely hinted at in the specifications and which the architect fondly hopes are covered by some general clause, and so underbid you. These clauses really have no place in a first class electrical specification, but are put in because some fellow years ago used them and so they are retained because they cover a multitude of sins of omissions and give the inspector some grounds for demanding the estimate. Estimating under these conditions is decidedly unsatisfactory to all parties, the contractor loses a good contract if he conscientiously estimates the work as it should be and as the architect would like to have it; the architect loses confidence in the contractor when he finds that he does not get the things that his specifications were intended to cover but did not cover on account of his inability to describe what he really wanted; and the owner joins the architect in condemning the contractor because he has to pay more for his work than his appropriation. The electrical work is not all that is affected in this way and more than one financially sound business proposition has been turned into a losing venture because the bills for extras have so materially increased the cost of the building that the design and plan becomes an economic blunder.

Again we find the very brief specification that tells in a general way that the architect would like to have a certain building wired, and requests that the contractor furnish a plan for his approval. This is placing on the contractor a burden which should not carry and in fact is simply telling him that the architect has a problem beyond his ability to solve and asks for help without being willing to pay for it. What the owner gets under these conditions you are perfectly capable of answering without my telling you, it being, in many cases, simply a matter between your judgment and conscience.

I am very glad to say that these practices are fast disappearing and that the architects are more and more calling into consultation the man who has studied this specialty, the electrical engineer. In this way he brings to his aid the trained mind of the specialist with his accumulation of experience and knowledge and ability to select and determine what best fulfills the needs of each individual case.

The results of this co-operation are beneficial to all. In the first place the owner is receiving the best available advice as to what will secure the most economical and efficient installation, and the contractor, when the tools, the plans and specifications are turned over to him, has, if the engineer's work has been well done, something definite to work with. A good set of plans and specifications should give him all necessary information for estimating and should eliminate all guessing as to what is really required and expected. These should be carried a step further than they have been in the past and be accompanied by a complete bill of materials, so that all contractors would be estimating on the same basis as to the quantities involved. In this case in all fairness to the contractor and owner unit prices should be required to cover any variations that might develop between the engineer's bill and the quantities actually used in the building. The extra work involved in the preparation of the bill should be paid for by the owner who in reality pays for it under the present system in the form of the contractor's overhead charges. A large per cent of your overhead is made up of the cost of estimating lost jobs and which in most cases is not paid by the proper party.

With a clear cut and definite plan and specification for the contractor to follow the owner secures the best results for the least expenditure, and the contractor knows what he is expected to furnish; he can make an intelligent estimate and if his errors of judgment are small, can be reasonably sure of his profit.

Working under this system the actual installation is certainly more satisfactory, as all differences can be settled by reference to the plans and specifications.

The change to this is slow, it being hard to convince owners and architects that the engineer's fee is a good investment and one that is in the majority of cases more than offset in the increased efficiency of his installation and the reduction in the actual cost of the work.

You as contractors can not only materially improve the business as a whole but also raise the standand of your specialty by co-operating with us in our endeavor to convince the owners and architects that their interests are best served when the equipment is designed by an engineer. We will not then have the spectacle of the engineering department of a public service corporation refusing to give service on the grounds that the installation is so poor that they are afraid to connect up to it.

A very convincing argument you can use immediately is to refuse to prepare plans and specifications unless they are paid for on a regular professional scale of fees. By adopting this suggestion you will again be able to reduce your overhead charges. You are not fair to one another when you carry on an engigeering business under the guise of contracting and I am sure the owners, once they see that they are not getting something for nothing, would feel that they were securing better results by the employment of an engineer, as no matter how ably or honestly the work is done, there will always be the feeling that there is somewhere a clause or provision favoring the man who did the work.

Our friends, the jobbers and manufacturers, are not free from criticism in this matter, as in order to secure the introduction of their special apparatus or appliances they will usurp the function of the engineer

and prepare plans and specifications; many times the resulting installation is not the one best suited for the particular case, and the contractor again has to bear the blame for something for which he was not at all responsible. The manufacturer who will say "John Smith's appliances will better suit your needs than ours, and I advise you to see them," is rare, but I take great pleasure in stating that many times within the last few months I have personally had this experience, when apparently the products were identical.

The manufacturer and jobber need not be afraid that his material will not be given careful consideration by the conscientious engineer, who is endeavoring to do good work. He is the man best fitted to say what should be used, as he can study and compare the various products presented for his consideration and has the whole manufacturing field to draw from. Let the engineer weight the evidence presented and after a careful analysis decide what he wants and then you as contractors give it to him. Ask for substitutions only when the products are comparable. Of course from the salesman's point of view, his product is as good as the other fellow's, but from an engineering viewpoint there may be a vast difference. I endeavor to consider everything presented and select that which I believe to be best suited to the needs of the particular case. The greatest compliment I have ever had came from a client who told me he did not see how I could go into such detail and make anything out of the work. I would rather have this said and know that the resulting plans and specifications gave the contractor an opportunity to do good work and a chance to make a reasonable profit than make money on the job by slighting my end of it.

The engineering profession is not free from blame in these matters as in order to get work, offers to furnish plans and specifications are often made at ridiculously low figures, much less than the actual cost for draftsmen and office expense of the man who does good work will amount to. As an example I recently quoted a client a flat sum of $600 for preparing a set of plans and specifications. After I had received the commission, he told me that an apparently responsible party had offered to do the work for $110. The result—I am sure, had this work been turned out for such a low figure, could not by any stretch of imagination have been called a first class piece of engineering.

Now let us get together and help one another. We can do it by co-operation. The engineer can give you first class tools to work with, so that you will know what to do and then the most important of all is for you to do it. Give him advice when he needs it so that he can prepare his work in such a way as will enable you to do yours in the most efficient manner and with profit to yourselves.

The owner and architect, by trusting to the engineer, will secure an economical and efficient installation. Let the jobber and the manuafcturer bring to the engineer's attention their various products, he will discuss with the owner their cost and the reasons why they should be used and in this way the owner can make his decision on an economic basis. Have the engineer make the estimates that go to make up the original budget for the building and then the electrical equipment will not be handicapped by lack of funds and you will then have a fighting chance for a living profit.

All of this you can greatly help the engineering profession in bringing about if you will urge the owners and architects to handle their work the way it should be done, and that is through the engineers.

BUSINESS IN THE PACIFIC NORTHWEST.

(The following items are abstracted with particular reference to the electrical industry from R. G. Dun & Co.'s semi-annual trade review for Oregon, Washington and Idaho.—The Editor.)

The general depression which has existed throughout the United States and Canada is apparent in the Pacific Northwest.

Two potent factors have been introduced into the business world in a degree not yet fully realized. The first is a new humanitarianism which demands the entire abolition of privilege. The new charter of business is to be founded on the axiom that equal fidelity in discharge of duties shall receive equal reward. To this can be referred such movements as income tax, minimum wage and old age pensions. The second is governmental direction of capital which can no longer be left to individual initiative with assurance of safety. Rate and trust regulation and the Federal Reserve Bank are referable to the latter.

Similar revolutions have marked the past. The world-wide readjustment of methods to conditions is considered practically complete and resumption of confidence and activity is seriously expected. The anomaly of bountiful prosperity in products of the forest, field, mine and sea and commercial stagnation should not much longer continue.

The total of railroad and street railway expenditures for construction and betterment has fallen to a low amount. The difficulty of securing capital for large undertakings is the chief deterrent. A number of logging roads are being constructed and some terminal improvements are being built, but few projects of large proportion are under way.

At Portland two houses report general decrease in volume of sales. Cost of doing business has decreased 5 per cent; failure losses increased 10 per cent, and net profits slightly less. General timidity is assigned as the cause of decrease and the outlook is for slightly better trade.

At Spokane one concern shows an increase in city sales of 30 per cent and a decrease in the country of 10 per cent, done at a decrease of .03 per cent. Net profits 5 per cent greater. Losses through failures 40 per cent greater. Need construction work. Collections somewhat close, but accounts mostly good. Another shows a decrease in aggregate sales of 10 per cent, done at an increased expense of 11 per cent. Losses through failures 3 per cent less. Net profits 34 per cent less.

At Tacoma electrical houses complain of poor conditions largely attributable to suspension of building operations. Prices, however, are better and net profits have increased about 10 per cent over the same period of last year. Collections are fair and with a considerable amount of work already in sight, prospects are good.

No specific report on the electrical supply business is given for Seattle, though in view of the excellent crop prospects, it is the general opinion that improvement in trade conditions will be noted during the latter part of the year.

EFFICIENT POWER PLANT MANAGEMENT

CORRESPONDENCE FILING CLASSIFICATIONS.

(Continued.)

100—Land and Structures.

110—Real Estate—Right of Way—Franchises—Leases.
- 111—For Buildings or Special Structures.
- 113—For Electric Transmission Lines.
- 114—For Gas Plant Uses.
- 115—For Water Distributing Systems—Dams—Reservoirs—Canals—Pipe Lines.
- 116—For Highways and Railways.
- 117—Franchises and Franchise Valuations.

120—Buildings.

(For Structural Materials, see 710.)
- 121—Proposed Extensions.
  - 121.1—Cost Analysis & Unit Costs.
  - 121.2—Valuations—Preliminary Reports.
  - 121.3—Investigations.
  - 121.4—Location.
  - 121.5—Program of Work.
- 122—Design and Construction Details—Specifications—Contracts—Bids.
- 127—Maintenance.
  - 127.1—Cleaning and Sanitation of Buildings and Yards.

130—Special Structures—Fences—Storage Bins.
- 131—Proposed Extensions.
  - 131.1—Cost Analysis and Unit Costs.
  - 131.2—Valuations—Preliminary Reports.
  - 131.3—Investigations.
  - 131.4—Location.
  - 131.5—Program of Work.
- 132—Design and Construction Details—Specifications—Contracts—Bids.
- 137—Maintenance.

200—Rates—Statistics—Contracts—Advertising.

202—Contracts.
- 203.3—Electric Contracts.
  - 202.3—Electric Contracts.
  - 202.32—Industrial Power and Lighting Contracts.
  - 202.33—Street Lighting Contracts.
- 202.4—Gas Contracts.
- 202.5—Water Contracts.
- 202.9—Other Contracts.

(Note:—File specifically when possible..

210—Statistics.
- 213—Electrical Statistics.
  - 213.1—Irrigation Power statistics.
  - 213.2—Industrial Power and Lighting Statistics.
- 214—Gas Statistics.
- 215—Water Statistics.
- 216—Railway Statistics.
- 217—Mdse. Sales Statistics.

230—Campaigns—Soliciting—Advertising.
- 230.1—Co-operative Campaigns — Bonuses — Profit Sharing.
  - 230.11—Electric Campaigns.
  - 230.12—Gas Campaigns.
- 230.2—Printed Advertising.
- 230.3—Fairs and Expositions.
- 230.4—Window Displays.
- 230.5—Demonstrations.

250—Rates and Tariffs.
- 250.1—Tariffs of Pacific Power & Light Company.
  - 250.13—Electric Tariffs.
  - 250.14—Gas Tariffs.
  - 250.15—Water Tariffs.
  - 250.16—Railway Tariffs.
- 250.2—Tariffs and Rates of Other Companies. (Correspondence File.)

253—Electric Rates.
- 253.01—Tariffs and Rates of Other Companies. (Documental File.)
- 253.1—Domestic Lighting.
- 253.2—Commercial Lighting.
- 253.3—Advertising Lighting.
- 253.4—Power (Industrial where not Specified.)
- 253.5—Irrigation Power.
- 253.6—Flour Mill Power.
- 253.7—Cooking Power.
- 253.8—Municipal and Street Lighting.

254—Gas Rates.
- 254.01—Tariffs and Rates of Other Companies. (Documental File.)
- 254.1—Lighting.
- 254.2—Cooking.
- 254.3—Heating.
- 254.4—Municipal and Street Lighting.

255—Water Rates.
- 255.01—Tariffs and Rates of Other Companies (Documental File.)
- 255.1—Domestic.
- 255.2—Industrial.
- 255.3—Municipal.

256—Railway Rates and Tariffs.
- 256.1—Freight.
- 256.2—Passenger.
- 256.3—Express.

Note:—In the case of a hydroelectric development, the matter as a whole shall be considered as hydraulic works, but correspondence relating to specific things shall be filed independently of the above ruling. Thus, letters relating to a hydraulic feature of the development shall be filed under the 500 series; letters relating to a feature of the power house structure shall be filed under the 120 series; and letters relating to electric details of the development shall be filed under the 300 series.

[To be continued.]

Sterilization of water by ultra-violet rays from a mercury-vapor quartz lamp is a promising source of income for central stations. The water must first be filtered and then exposed to the influence of the rays, baffle-plates being frequently employed to keep the water sufficiently agitated. One form of apparatus for home use sterilizes 20 gallons per hour with an energy consumption of 250 watthours.

The doctrine of principal and agent (as the proper relation existing between the public and the public utility company) fails at the point of fixing responsibility for the supplying of initiative. Ordinarily the principal conceives and the agent executes.

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Change of advertising copy should reach this office ten days in advance of date of issue. New advertisements will be accepted up to noon of Monday dated Saturday of the same week. Where proof is to be returned for approval, Eastern advertisers should mail copy at least thirty days in advance of date of issue.

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The Futility of Water Utilization

An astounding discovery has been made by a wise man from the East—since all the coal must be consumed some time and since water power can be used just as well when the coal is exhausted as now therefore the present use of water power can effect no eventual saving in fuel; it "simply renders available, at some future period, a certain proportion of the fuel which might otherwise have been consumed at a prior date."

Like the socialist who expects to carry out one of the two great ideals of the Bible, the service of all men by all other men, by opposing it to the other great ideal, the value of the individual, so this enlightened engineer would accomplish one ideal of true conservation, the prevention of waste of those resources which cannot be renewed, by fighting the other ideal, the wise utilization of those fleeting resources which are regularly renewed.

The conservation which has resulted from the more efficient use of fuel "far exceeds any results that could have been attained by the use of all the water powers in present service." The non-utilization of water power "is no more of a loss to the world than our present lack of use of the heat of the sun, the movement of the wind, or the rise and fall of the tides."

Such sophistry would be beneath notice if it were not for the fact that these ravings carry a certain prestige as part of a paper presented before the American Society of Heating and Ventilating Engineers. Were we not acquainted with the noble purposes of that organization and its constituent members this futile effort to stem the tide of progress might be considered as the swan song of a dying profession, the last gasp of a drowning man. Heartily agreeing that the effective utilization of the fuels which nature has so abundantly placed at our command constitutes true conservation, is not sane reason for this distorted antagonism to the development of water power.

The expenditure of the public's money "on the vacillating waters of falls, rivers and rapids, where coal stands ready at less cost to afford cheaper and better service" is not within the power or the purpose of the most radical conservationist, nor has "conservation widened into the advocacy of the development of water powers as a substitute for the use of fuel." Such a policy would be even narrower than the perverted view of this heating and ventilating engineer fearful that his brother engineers will lose their jobs. Open the window and let in some fresh air.

Federal versus State Control

While we of the West are pointing out the ion in our Eastern neighbors' views, we must not overlook the dangers from the macrocosm in our own.

From time to time this journal has called attention to the hardships that are now being imposed upon those men who are endeavoring to promote the general good by developing the latent natural resources of the West, whether of timber, mineral or water power. The injustice has been shown of compelling the power locator to serve the will of two masters, the state and the nation, each imposing a discriminatory tax on water power de-

velopment, the state on the right to use the water, the nation on the right to occupy the land drained by that water. It has been frequently demonstrated that this dual tax is heavier than would be the rental of similar private holdings, the federal tax especially, being based not on the intrinsic value of the land, but on the value of the water flowing over it.

But no matter how true these facts nor how heavy the burden entailed, they should not be made the excuse for reactionary suggestions of rebellion against sovereign authority. There are state rights, put there are also national rights.

In accordance with the requirements of that beneficent mechanism known as govenment, the individual cheerfully surrenders certain personal rights to the city or county so as to gain compensating community benefits. The city or county, in turn, voluntarily delegates certain of its functions, such as rate-making, to the state. The state, likewise, entrusts certain powers, such as the control over the public domain, to the nation, just as nations also agree to submit specified matters to a tribunal of other nations.

Once these rights have been surrendered they can seldom be resumed without a revolution of the entire social framework. The rights established by custom frequently contravene the rights established by law. They can be overthrown only by war.

The specific application of these generalities is found in this question of federal versus state control of water power development. There are those who believe that the presumption of the federal government is fundamentally wrong in considering that its trusteeship invests it with the same powers as would absolute, permanent ownership, and that the mask of conservation is being used to further plans for the establishment of a long distance administrative bureaucracy. Likewise there is an effective public opinion that the rights of the many can be more adequately protected by this means, even if it is done at the expense of the few.

As a matter of fact there should be no conflict between these divergent views. Mutual concession should admit of mutual understanding on a common ground. With respect to the prevention of destructive waste there is little difference between the interest of the individual and the interest of the public. As to the waste due to misuse the interest of the individual must be subordinated to the interest of the public just as in the case of the waste due to non-use it would be well to even give a slight advantage to encourage the individual developer.

Instead of arraying these interests against each other they should be harmonized so that they will cooperate to co-ordinate a mutually satisfactory water policy.

The advantages of a strongly centralized government are too great to be lightly cast aside at slight provocation. In the ultimate analysis state authority and federal control will be found to revolve in concentric orbits with the will of the people as the driving force which creates each. And finally patriotism, above all else, will see to it that the American people carry out the policy of conservation to which they are definitely pledged.

The Economy of Effectiveness

The present estimated stand of three thousand billion feet of lumber is being depleted at the rapid rate of sixty billion feet or more annually. An investigation is to be made by the Forest Service, the Bureau of Foreign and Domestic Commerce, the Bureau of Corporations and the Bureau of Standards, each co-operating in their respective fields—to the end of determining the most advantageous methods of using, without waste, the present stand of timber, and the possibility of applying forestry to the future management of timber lands.

At present, both forestry and milling are so wasteful that it is estimated that from one-third to one-half or more the tree timber is burned as worthless, either in the slash fires or waste burners. It is also claimed that it is practically impossible to market the poorer grades of lumber in the home market. Outlets for these are, therefore, to be found abroad.

All this brings vividly to mind the deplorable mill fires which have recently been reported with monotonous regularity. As millions of feet of milled lumber are destroyed in this way, it would appear that those who design mills might well further this new conservation, as it almost invariably occurs that the fires have their origin in the boiler room, the drying kilns, or, near the waste burner.

Mill designers should recommend, and if found necessary, actually enforce, precautionary measures which adopted by the industry would practically eliminate these disastrous fires.

The boiler room is almost invariably in the heart of the mill, the waste burner quite convenient, and the drying kiln equally so. These should certainly be isolated, and could be at but slightly additional expense.

The principal hazard consists in the burning of mill refuse, and various shifts have been tried to avoid having to do this. Herein lies opportunity. It has been used for steam generating purposes with a considerable measure of success. It has been used with experimental success for the generation of illuminating gas and in this direction the possibilities are vast. It has been successfully briquetted, for domestic fuel purposes. In British Columbia the waste from soft woods, by a process of pulverizing, shredding and drying, has been brought into a condition which permits its being compressed into briquettes either with or without the addition of other combustible by-products such as tar, pitch, and so forth. Hardwood may be more readily handled in this way.

Only those who have witnessed the mill refuse fires, mountain high, burning fiercely year in and year out, can marvel most that genius has not devised many methods of preventing this sinful waste. Effective utilization only is economy and it is to be hoped that the investigation to be now carried on will discover ways and means of effectively utilizing mill and forest waste. In the meantime, it must be recognized that the opportunity belongs to the qualified engineer, the man who does not cling too closely to custom but whose designs are based upon the economy of effectiveness.

PERSONALS

A. J. Bowie, electrical and mechanical engineer at San Francisco, is expected to return from San Diego this week.

I. N. McKinney of NePage, McKinney Company, electrical contractors, Seattle, arrived in San Francisco during the week.

N. D. Powell, contractor of Stockton, Cal., and Mrs. Powell, were visitors to San Francisco during the week on a business trip.

J. Van Huysen, salesman of the General Electric Company, Fresno, Cal., was an arrival in San Francisco during the week.

J. Carter, district manager of the San Joaquin Light & Power Company at Taft, California, spent the week in San Francisco.

W. Brewster Hall, Pacific Coast representative for Pass & Seymour Company, has returned to San Francisco from an Eastern trip.

C. A. Gray, district superintendent of the Pacific States Telephone Company at Pullman, was at Spokane, Wash., during the past week.

Don C. Ray, manager Contra Costa District, Pacific Gas & Electric Company, located at Martinez, was a recent visitor in San Francisco.

Chas. Brown, traveling auditor for Westinghouse Electric & Manufacturing Company, East Pittsburg, spent the last week in San Francisco.

E. R. Davis, general manager of the Pacific Light & Power Company, Los Angeles, spent a few days during the past week at San Francisco.

E. J. Crawford, superintendent of distribution, San Joaquin Light & Power Company, Fresno, was a visitor to San Francisco during the week.

A. E. Wishon, assistant general manager, San Joaquin Light & Power Company, Fresno, spent several days in San Francisco during the week.

W. A. Blair, treasurer Pacific States Electric Company, San Francisco, returned during the week after a several days' trip to Southern California.

S. B. Anderson, district manager Pacific States Electric Company, San Francisco, left during the week for a trip through the Tahoe region.

A. H. Babcock, consulting electrical engineer for the Southern Pacific Company, is making an automobile trip through California and Nevada.

P. H. Affolter, salesman with Fairbanks, Morse & Company, San Francisco, recently returned from an extended trip through the San Joaquin Valley.

Geo. R. Murphy, treasurer for Pierson, Roeding & Company, and Pacific Coast representative of the Electric Storage Battery Company, is at Philadelphia.

C. A. Johnson, representative of the C. A. Wood Preserver Company at San Francisco, returned during the week after an extended trip through the northwest.

E. M. Cutting, manager Edison Storage Battery Supply Company, San Francisco, returned the first of the week from an extended trip through the Pacific Northwest.

Fred L. Webster, Pacific Coast manager of Allis-Chalmers Company, San Francisco, returned during the week from a trip to Los Angeles and the southern part of the State.

F. C. Carman, representing the National Electric Heating Company of Toronto, Ont., is making western Canadian cities and arrived on the Pacific Coast during the past week.

W. T. Wallace, general manager of the Great Shoshone & Twin Falls Water Power Company, is in Salt Lake City in connection with extension of his company's business.

O. P. McCord of the Westinghouse Electric & Manufacturing Company's sales force, San Francisco, is confined to his bed, having recently undergone an operation for appendicitis.

Miss Nell Howard Murray, daughter of Fred Murray, and in charge of the Los Angeles office of the National Carbon Company, visited San Francisco during the week on a business trip.

S. M. Frew, assistant manager light and power department, British Columbia Electric Railway Company, was at Seattle, Wash., during the past week on a combined business and vacation trip.

C. J. Wilson, assistant engineer of electrical distribution for the Pacific Gas & Electric Company, has been elected chairman of the San Francisco Section of the American Institute of Electrical Engineers.

H. P. Wilson, secretary of the Great Western Power Company, and **Edward Beardsley,** chief engineer, inspected the Oakland district during the past week under the guidance of **Frank H. Woodward,** manager of the Oakland division.

Bion J. Arnold, street railway traffic expert, and well known on the Pacific Coast, is at present detained in Germany, where he was visiting at the time of the outbreak of hostilities, with a number of traffic men investigating practice in European countries.

J. G. M. Connally, until recently with the Western Canada Power Company, has now engaged in business as an electrical engineer, undertaking electric lighting and power contracts, dynamo and motor repairs, steam, gas and oil engineering, at Vancouver, B. C.

James Morris, of Portland, Ore., was appointed at the last council meeting of the city of Lewiston, Idaho, to make a preliminary estimate of the cost, amount of power available and other data relative to the proposed dam and power site on the Clearwater River to be developed by the city.

H. W. Dyson has been appointed comptroller of the British Columbia Electric Railway Company at Vancouver, B. C., succeeding **Geo. Kidd,** who has been promoted to the position of general manager. Mr. Dyson was assistant comptroller of the company from 1910 up to the time of his promotion.

Richard H. Dearborn, professor of electrical engineering at the University of Oregon at Eugene; **C. S. Hull,** foreman of the standardizing laboratory of the General Electric Company at San Francisco, and **S. C. Lindsay,** electrical engineer for the Seattle Electric Company, at Seattle, have been transferred to the grade of member in the American Institute of Electrical Engineers.

MEETING NOTICES.

Nevada First Aid and Mine Rescue Field Meet.

On September 7th a first aid and mine rescue field meet will be held at Reno under the auspices of the Engineering School of the University of Nevada, J. G. Scrugham, dean. Fifteen teams of five members each have been entered, representing all the large industries of the state. The State Electrical Association will hold its quarterly meeting on the same day. Among the papers to be presented will be one on the Buckhorn Locomobile Plant Performance by J. G. Scrugham and A. N. Voss and Nitrogen Headlight Performances by A. G. Jones.

San Francisco N. E. L. A. Convention Committee.

John A. Britton, chairman of the General Convention Committee for the San Francisco meeting of the National Electric Light Association in 1915, called a meeting of the local committee on August 17th when plans were made for active work by the various sub-committees. It was decided

that such general meetings will be held every other week from August 31st in order that the several sub-committees may submit their plans for general discussion. It is particularly desired that wide publicity be given to the fact that the Exposition will be open on schedule time and that rumors of war will not interfere with the success of the N. E. L. A. convention.

NEWS OF CALIFORNIA RAILROAD COMMISSION.

The Pacific Power Company of Mono county has filed an application asking the commission to validate 100 promissory notes totaling $100,000 issued without the consent of the commission.

The commission has rendered a supplemental decision authorizing the Southwestern Home Telephone Company of Redlands to issue promissory notes in the sum of $4500 and to pledge bonds therefor in the ratio of 2 to 1.

The Consolidated Securities Company has filed an application with the Railroad Commission asking authority to sell the telephone system in the City of San Fernando, Los Angeles County, to the San Fernando Telephone and Telegraph Company.

The Railroad Commission has rendered a decision dismissing the application of the Midland Counties Public Service Corporation for authority to issue a note in the sum of $6500. The application was dismissed on the request of the corporation.

The commission has rendered a decision authorizing the Roseville Telephone Company to issue 100 shares of capital stock of the par value of $10 per share. The proceeds from the sale of this stock are to be used for additions and betterments to the company's plant.

The commission has rendered a decision authorizing the Soledad Land & Water Company to sell certain portions of its property. The Soledad Land & Water Company is endeavoring to change its status from a public utility corporation to a mutual water company.

The Butte Valley Telephone Company, operating in the vicinity of Dorris, Siskiyou County, has filed an application with the Railroad Commission asking authority to issue 22 shares of stock in lieu of other shares previously issued without the consent of the Commission.

The Railroad Commission has rendered a decision authorizing the Hanford Gas and Power Company to issue a promissory note in the sum of $6000 for 90 days at 6 per cent with authority to reissue in the same or smaller amount up to and including August 10, 1915.

The Postal Telegraph-Cable Company has filed a complaint with the Railroad Commission against the Western Union Telegraph Company. This complaint is the outgrowth of a suit relative to the transfer of telegrams brought by the Postal Company against the Western Union before the Public Service Commission of New York.

The Northern California Power Company, Consolidated, has filed an application with the Railroad Commission asking authority to issue $500,000 par value of preferred stock at $80 per share. This is a 6 per cent cumulative stock and it is proposed to use the proceeds thereof to reimburse the company for moneys actually expended from income.

The Railroad Commission has issued a supplemental order authorizing the Southern California Edison Company to issue 321 of its 5 per cent bonds, having a par value of $1000 each, at 87½ per cent and accrued interest. These bonds are the last remaining portion of an issue of $2.500,000 authorized by the Commission in the latter part of January, 1913.

The commission has rendered a decision authorizing the Oakland, Antioch & Eastern Railway, operating between Oakland and Sacramento, to issue $900,000 of 3-year promissory notes bearing interest at the rate of 6 per cent per annum. These notes are to be redeemable at the option of the railroad at any interest date at their face value and accrued interest on not less than 30 days' notice. The company is further authorized to issue $330,000 face value of first mortgage 5 per cent bonds and pledged these bonds together with others heretofore authorized by the commission as security for the payment of the notes at the ratio of 2 to 1. These notes will be convertible, at the holder's option before maturity on the basis of 80 per cent of the par value of the bonds with accrued interest as against the par value of the notes with accrued interest. The commission's order provides that the notes shall be sold for not less than 96, provided, however, that the company may pay a commission for their sale of not to exceed 4 per cent.

California Commission Order on Inductive Interference.

The California Railroad Commission has issued a general order to the power companies of the state regarding inductive interference. This order is based upon the exhaustive investigation of a committee which will present its formal report at the Spokane meeting of the American Institute of Electrical Engineers, at whose specific request the details will not be published until after the meeting. The order differs from the recommendation of the committee in being retroactive, affecting past as well as future construction. It provides for avoidance of parallelism between power and communication lines when possible and for care in making transpositions. In any power circuit involved in a parallelism no grounded single-phase or grounded open-star transformer connections shall be employed, the use of air switches is practically prohibited and deviations from a pure sine wave shall not be allowed to exceed the limit imposed by the A. I. E. E. Standardization Rules.

NEWS OF IDAHO PUBLIC UTILITIES COMMISSION.

The public utilities commission will probably issue, within the next few days, an order which will standardize the operation of crossings of power lines, interurban systems and signal wires, which will conform to the ideas of the officials of power, traction and railroad companies, whose representatives have been in conference in Boise, since Monday morning. The meeting of the representatives of the various corporations was called at the request of the public utilities commission who desired, before taking action, to have those affected outline an order or rule, which would insure the safety of the public.

The sessions at the Owyhee hotel were presided over by Chas. E. Cochran, assistant general attorney of the Oregon-Washington Railroad & Navigation Company, Portland, Ore. Fred L. Goddard of the Utah Power and Light Company, acted as secretary.

The greater part of Monday and Tuesday sessions was devoted to receiving statements from the representatives of the various organizations. All were unanimous in their suggestions for the safety of the public and all possible friction was settled satisfactory to all. The agreement will probably be signed and sent to the public utilities commission today.

BOOKS RECEIVED.

Arizona Corporation Commission. First Annual Report; 1055 pp.; 6x9; published by the Board of Control, Phoenix, Ariz.

According to the constitution of Arizona control of public utility corporations, as well as all other corporations, is vested in a three-member commission whose report for the period from February 14, 1912 to December 1, 1913, is here presented. In addition to a summary of the corporation laws of the state and definitions of the commission's powers and duties it contains copies of all special orders issued, all complaints investigated and all docket cases handled by the commission. Details are given of the uniform system of accounts prescribed by the commission and many other matters of interest have been compiled here.

OREGON UNDERWRITERS' BUREAU ON GROUNDING SECONDARIES.

Electrical Circular No. 49.

The general regulations governing overhead and underground contruction of telegraph, telephone, signal, trolley and power lines within the State of Oregon became effective October 1, 1913; and Rule 14 of these regulations requires the grounding of the neutral point or wires of all transformer secondaries. This order does not affect municipally owned electric utilities and only applies to new construction work of privately owned electric utilities.

The National Electrical Code Edition, 1913, Rule 15 (b) requires grounding of all installations, old and new, regardless of ownership.

Rule 15 (b) of the National Electrical Code reads as follows:

b. Transformer secondaries of distributing systems (except where supplied from private industrial power or lighting plants where the primary voltage does not exceed 550 volts) must be grounded, provided the maximum difference of potential between the grounded point and any other point in the circuit does not exceed 150 volts and may be grounded when the maximum difference of potential between the grounded point and any other point in the circuit exceeds 150 volts. In either case the following rules are to be complied with:

1. The grounding must be made at the neutral point or wire, whenever a neutral point or wire is accessible.

2. When no neutral point is accessible, one side of the secondary circuit must be grounded.

3. The ground connection must be at the transformers or on the individual service as provided in sections c to g, and when transformers feed systems, with the neutral wire, the neutral wire must also be grounded at least every 500 feet.

This bureau also feels that thorough grounding of all alternating secondary systems affords the best protection to life and property.

Central Station will kindly answer the following questions in writing, concerning the system of distribution:

1. Do you ground your secondary transformers at the neutral points, or neutral wire, in both old and new work?

2. Do you ground your secondary transformers at neutral points or wires in new work only?

3. Do you ground one side of secondary circuit in lieu of the neutral points or wires, in old and new work?

4. Do you ground one side of secondary circuit in lieu of the neutral points or wires, in new work only?

5. Kindly state reasons why you do not ground your transformers, at the neutral points or wires.

6. If your system is grounded, describe method used to ground same.

7. If you have not grounded your old and new construction, do you intend to do so and by what date will this be accomplished?

8. If you have not grounded your old construction, do you intend to do so and by what date will this be accomplished?

Note:—If your company operates in more than one town or city, kindly segregate the information on each if necessary.

Electrical Circular No. 50—Porcelain.

After November 1, 1914, this Bureau will require all porcelain such as tubes and bushings, cleats and knobs to conform at least to all the requirements of the National Electrical Code.

Tubes and Bushings—Rule 61.

Cleats—Rule 62.

Knobs—Rule 64.

Recently our attention has been called to several stocks of solid No. 5½ porcelain knobs, which do not comply with the above rules in the following respects:

(1) Less than 1⅛ in. in diameter;
(2) Depth of wire groove;
(3) Un-uniform as regards height;
(4) Glazing of poor quality in some cases;
(5) Easily broken.

Therefore, in future, kindly insist when purchasing porcelain, that it complies with the general requirements of the National Electrical Code, Edition 1913, as the manufacturers are in a position to furnish same if you insist upon it.

UNDERWRITERS' EQUITABLE RATING BUREAU,
F. D. Weber, Electrical Inspector.

PACIFIC GAS & ELECTRIC TENNIS TOURNAMENT.

The fourth annual tennis tournament of the Pacific Gas & Electric Company, San Francisco, will be played in Oakland, Sunday, August 23rd. Owing to the great form shown in practice games it is predicted that S. J. Lisberger and A. L. Trowbridge, will play the finals, although E. B. Henley promises to figure as a contender for the cup, which is annually at stake.

TRADE NOTES.

Woodill & Hulse Electric Company has been given the contract to furnish the city of Los Angeles with 977 traffic signs.

Drennen Electric Company has the electrical contract for the apartment house being erected by A. Shogren at Seventh and Madison streets.

H. A. Bullard has opened an office as special designer for special electric and hydraulic apparatus in the Underwood Building, San Francisco.

The contract for installing a freight elevator at the B. C. Electric car barns has been awarded to P. E. Harris & Company Crown Building, Vancouver B. C.

The Sierra and San Francisco Power Company has closed with Westinghouse Electrical and Manufacturing Company for a period of years on their contract for service transformers.

The Capital Electric Company of Salt Lake City has recently closed a contract with the Newhouse Hotel Company for the installation of a 7½ h.p., 3 sweeper Spencer turbine cleaner plant for the Newhouse Hotel now nearing completion.

The W. H. Smith Electric Company of Portland, Oregon, has obtained the following electrical contracts: Felden heimer Building on the northeast corner of Fourth and Salmon. The Halman Building on Third and Mill streets, and the new Signal Tower, N. P. R. Co.

The plant and stock of the Fern Ridge Lumber Company at Fern Ridge, B. C., on the Fraser Valley Branch of the B. C. Electric was completely destroyed by fire last week. The loss is estimated at $150,000, with $100,000 insurance; $72,000 on the mill, and $30,000 on the stock in the yards. There were several million feet of lumber in the yards. Fire started in the dry kiln. No announcement has been made as to whether the mill will be rebuilt.

SEATTLE WOULD LICENSE ELECTRICAL CONTRACTORS.

At a meeting of the council of the city of Seattle, Wash., held last week, Councilman Cooley introduced an ordinance requiring that all electricians take out a license with the city and put up a bond of $1000. Persons under 21 years of age are forbidden to supervise or install electrical work. Certain exceptions are made to cover apprentices. The same bill allows for certain changes in the current carrying capacity allowable for wires under special conditions.

INDUSTRIAL

MODERN FIXTURE FACTORY AT PORTLAND.

BY F. D. WEBER

No student of commercial conditions who is keenly interested in his subject cannot help but be impressed with the rapid specializing process which is abroad in all lines of endeavor. In no business is this more marked than in the electrical line. All of us can remember for instance when lighting fixtures were displayed only over bath tubs and wash-

Factory Exterior.

stands in the local plumber's shop and the designs shown were the cheapest that the designer could imagine. What a long step in a forward direction is the modern lighting fixture display room? An examination of these two extremes accentuates the fact of a decided change in the attitude of the public mind on this particular subject i.e. "they are no longer ugly necessities, but rather a vital component part of the interior decorative scheme."

During the recent convention of the Oregon Electrical Contractors' Association held in Portland the program committee included in its attractions a visit to the new factory and show rooms of the J. C. English Company, 165 Union Av-

Lighting Fixture Factory.

enue North, corner Irving, and it must have been gratifying to the company to hear the expressions of surprise and commendation heard on all sides.

Aside from the completeness of the manufacturing facilities and the beauty of the show rooms the fact that this business had moved its display rooms from the center of the congested district to the East Side so as to be combined with its factory in order to promote efficiency seemed to all a daring move. Some of us felt English must have read what Elbert Hubbard said in the Philistine: "If you write a better book or build a better mouse trap, though your shop be in the woods a beaten path will be made to your door."

The object of this article is to demonstrate what can be done in a simple way to properly equip a lighting fixture plant with the objects of promoting efficiency and to maintain dignity, all at a modest cost.

The building is two story, 50x100 ft. It is situated on a corner so as always to preserve the light. The first floor is used almost exclusively as a show room. Entering from Union avenue between two large bay trees flanked on both sides by beautiful flowers, you are ushered into the reception room paneled to the ceiling with fir wainscoting finished to resemble English oak. The style of the room is early English and the heavy woodwork is relieved by warm red velour hangings. The floor is covered with Oriental rugs neutral design giv-

Show Room.

ing the room a cosy homelike atmosphere and this is added to by a beautiful tile mantle especially designed for the place.

The general office of the company is in the opposite corner so as to give immediate attention to visitors and back of this is the office of the manager.

Passing through the reception room you enter an L shaped room where most of their simpler fixtures are displayed. The reason for this being next to the reception room is to eliminate the necessity of taking everyone into the more elaborate rooms still further in the rear.

The most beautiful show room the writer has ever seen is the Colonial room, which is 24x32 ft. The woodwork is ivory and the walls a grey glass cloth. This is relieved by a handsome colonial mantle with green tile. The hangings are also in green.

Special offices are occupied by the designing staff. A room is provided for displaying fixtures particularly adaptable for bungalows and suitable space is also provided wherein fixtures on a particular job can be shown together, doing away with the necessity of passing back and forth, thus concentrating the customer's attention on the pieces they are interested in.

The rear of the first floor is occupied by the gilding and finishing department as well as a large shipping room; an elevator at this point delivers the freight to the manufacturing department on the floor above.

The entire second floor is a delight to the workman who appreciates sanitary conditions. The greater portion of the wall space is occupied by windows, the whole interior is painted white and they have just installed a ventilating system to change the air in the factory oftener.

The factory is equipped with all modern machinery, electrically driven, and the heating is done by the Rector gas system. Each workman's bench is supplied with gas, air and electricity. A separate stairs leads to the garage on the first floor, this allowing them to load without going outside.

The company has been in business five years and has lighted most of the principal buildings in Portland and has done a great deal of work throughout the Northwest. They have recently finished the Northwestern Bank Building, Pittock Block, Pittock residence, Supreme Court and Library Building, at Salem, Multnomah County Court House and every bank built in Portland since they have been in business except one.

NEW UNITS FOR ORNAMENTAL STREET LIGHTING.

An attractive line of fixtures, designed for operation of the new sizes of Mazda series lamps for "White Way" or ornamental street lighting, is now being made by the General Electric Company. These new fixtures are termed Novalux ornamental units, are made for both series and multiple operation and will accommodate the 400 and 600 c.p. 6.6 amp. and the 600 and 1000 c.p. 20 amp. sizes of the series Mazda, and the 400, 500, 750 and 1000 watt multiple Mazda lamps.

They are made in two general styles, the only difference however, being in the glassware equipment. The glassware on one style, Form 4, consists of a medium alabaster globe, which is so shaped that it is completely filled with light

Novalux Ornamental Street Lighting Unit.

and permits a certain amount of light to pass upward and illuminate the building fronts. There is a small reflector placed at the top and inside of the globe. The function of this reflector is to direct downward and make useful the light that would otherwise be lost in the bottom of the ventilator surmounting the globe.

The other style of unit, Form 5, has a two-piece globe. The bottom part is made of C. R. I., that is, crystal rough inside glass, while the top is made of Pyro glass. No reflector is used, as the Pyro top is made of dense glass having the inside glazed, thereby reflecting downward some of the light, although enough filters through to illuminate properly the building fronts.

These new units are highly ornamental and the casings, which are designed to form the capital of the pole, are made in four different styles, from which a selection can be made to harmonize with the pole design.

As ventilation is an important feature in fixtures designed for the new sizes of Mazda lamps, this matter has been given careful attention. Air enters through small holes in the globe seat and leaves, in the case of the Form 4 unit, through concealed openings in the spun copper ventilator at the top of the globe; and, in the case of the Form 5, it leaves through the space provided between the top and bottom globe. The socket used in these fixtures is made in skeleton form which permits a circulation of air to all parts.

As the efficiency of the 20 amp. Mazda series lamps is much higher than that of the 6.6 amp. lamps, the Novalux ornamental series unit contains an internal individual compensator mounted inside of the ornamental casing.

These compensators operate the 20 amp. lamps on 6.6 or 7.5 ampere circuits. This saves about 30 per cent of the energy required to operate the lamps and permits them to be connected in standard existing circuits, thereby allowing the extension of the lighting system without additional station equipment.

The compensator also reduces the effect of destructive current surges that may be set up by arcing or permanent grounds. Two different sizes of compensators are made for use respectively with the 600 and 1000 c.p. 20 amp. series Mazda lamps and are equipped with taps for operation on either 6.6 or 7.5 ampere series alternating constant current circuits. The series unit is mounted on a strain insulator whose function is to keep high voltage from the poles.

The multiple Novalux ornamental units are similar to the series except that the strain insulator is replaced by a cast iron adapter of similar dimensions and no compensators are used.

A NEW CADDY CALL.

A novel installation of the chau-phone, the Western Electric Company's limousine telephone, was made recently at the Los Angeles Country Club, Beverly Hills, California. It has been the custom of that club's golf professional to call his caddies by megahone when he wanted them to go out with the players.

A Western Electric chau-phone was installed. Now caddies can be summoned at once, the professional saves his lungs, club members are paged, the progress of matches announced, and many other practical uses made of the device.

EXAMINATION FOR JUNIOR ENGINEER.

The United States Civil Service Commission announces an open competitive examination for junior engineer (experimental plant and machine testing), for men only, on September 2 and 3, 1914, at a salary ranging from $1200 to $1800 a year. The duties of this position will consist of designing, constructing, and operating plants for experimental and demonstration purposes in the preparation of certain fruit and vegetable products, especially fruit and vegetable drying and refrigeration, the computing and compiling of technical and cost data on the operation of such plants; and a limited amount of mechanical drafting.

Competitors will be examined in mechanical and dynamics of engineering, technical engineering testing, education and experience.

Applicants for this position must have a mechanical or electrical engineering degree from a technical school of recognized standing, and two years' practical experience, subsequent to graduation in an experimental laboratory or in machine testing.

NEWS NOTES

INCORPORATIONS.

SALT LAKE CITY, UTAH—With $1,000,000 capital, the Salt Lake Light & Traction Company, organized to deal in light, heat and power, has filed its articles of incorporation. O. J. Salisbury, S. A. Whitney, A. H. Parsons, J. B. Walker and C. W. Johnson are the incorporators and directors. Salisbury is president, Johnson is vice-president, Whitney is treasurer, and Parsons is secretary. It is understood the company plans a comprehensive public utility business, including the erection and acquisition of plants for the generation of electricity for power and lighting and steam heat for heating purposes.

FINANCIAL.

LOS ANGELES, CAL.—A meeting of the stockholders of the Southern Counties Gas Company has been called for August 22d, to consider the question of increasing the bonded indebtedness of the corporation to $2,600,000; present bonded indebtedness, amounting to $1,000,000.

SAN FRANCISCO, CAL.—The Pacific Gas & Electric Company announces that, having secured subscriptions for more than 70 per cent of its issue of $12,500,000 of new first preferred stock, the financial plan outlined in a letter to stockholders dated June 3, 1914, was declared operative at a meeting of the board of directors last week. The subscriptions which exceed $8,750,000, were received from approximately 3000 subscribers, of whom a great proportion are new stockholders. In view of the disturbed financial conditions, brought about by the European war, and to avoid unnecessary hardships upon subscribers, the company, through its board of directors, has deferred the time of payment of the second installment of $15 per share from August 15th to October 15th; of third installment of $12.50 per share from October 1st to November 15th, and of the fourth installment of $12.50 from January 1 to February 15th. Following is therefore the revised schedule of installment payments on the basis of the sale price of $82.50 per share authorized by the State Railroad Commission: $5 per share with subscription; $15 on or before October 15th, $12.50 on or before November 15th; $12.50 on or before January 15th; $12.50 on or before April 1st; $12.50 on or before July 1st, and $12.50 on or before October 1st, 1915.

SALT LAKE CITY, UTAH.—Credence is given to the persistent rumors that the Utah Power & Light Company is considering the purchase of the Utah Light & Railway Company by the presence in Salt Lake City of a corps of accounting experts who are going over the books of the company. Judge Robert S. Lovett, chairman of the board of directors of the Union Pacific system which controls the Utah Light & Railway Company, who is in Salt Lake City, has this to say: "I always refuse to say yes or no to questions concerning the company's negotiations. It is soon enough for me to talk about them after they have been consummated. Such rumors cannot be always honestly denied and it is not good policy to confirm them, and to get around the situation I always refuse to talk about them." The Harriman system purchased control of the Utah Light & Railway Company eight years ago for a consideration of approximately $3,000,000 and has spent since that time approximately $7,000,000 on the system. The company furnishes the entire electric lighting, power and street railway service in Salt Lake City and the majority of the lighting and power service of Ogden. The acquiring of this property by the Utah Power & Light Company would give them a virtual control of the entire light and power system in the state of Utah.

ILLUMINATION.

SEARCHLIGHT, MONT.—Place & Donaldson, of Fried, are making arrangements for establishing an electric light plant here.

COLUSA, CAL.—Plans and specifications were approved for the Princeton Lighting District. Bids will be received until September 10th.

CULDESAC, IDAHO.—W. L. Marrs, Coeur d'Alene, recently granted a franchise for a light plant here, expects to start work September 1st of installing a plant.

SOCORRO, N. M.—J. Gordon Lovelace, manager for the Socorro Electric Light Company, has resigned to accept a similar position with the Phelps Dodge Company at Tyrone, N. M.

BURNABY, B. C.—At a recent meeting of the council the engineer reported on a proposed extension of the street lighting system recommending the installation of fifty additional arc lights. This will bring the total installed up to 257.

LOS ANGELES, CAL.—Specifications for an additional lighting system in the Lankershim Lighting District have been adopted by the council and the city clerk has been directed to advertise for bids to be received up to August 24th.

AUBURN, WASH.—The Council has granted a franchise to the Auburn Gas Company, represented by J. L. Veach and contracts for the installation of modern fuel and illuminating gas plant will be awarded. The estimated cost is $40,000.

DUNCAN, ARIZ.—J. E. Allen, one of the owners of the present electric light plant at Duncan, reports the purchase by himself and associates of a building located in the Head Addition, and the installation in the near future of a complete electric light plant.

SHERIDAN, ORE.—The Oregon Light and Power Company have been awarded a three-year contract for lighting the City of Sheridan. The Willamina Electric Company has been awarded the contract for lighting the City of Willamina for a period of five years.

LOS ANGELES, CAL.—The board of supervisors will receive bids up to August 31st for maintaining lights in Stephenson avenue and Laguna Lighting District, also for installing and maintaining an addition to the system of street lighting in Annandale Lighting District.

FORT BENTON, MONT.—Bids will be received by John F. Murphy, city clerk, up to August 17th for the purchase of $17,000 in bonds, the proceeds to be used in the construction or purchasing of a light plant for the city. Interest at 5½ per cent. Certified check for $1000 payable to the city of Fort Benton, required with bid.

OREGON CITY, ORE.—The franchise of the Clackamas County Gas Company to lay mains in the Whitehouse road to Oswego has been granted. The company which is laying the main from Portland to Oregon City, plans to build a line across the river below Milwaukee to Oswego and then back again above the town on the east side of the river.

NOGALES, ARIZ.—A petition is in circulation for presentation to the board of trustees asking the board to rescind its former action postponing for six months consideration of the proposed electric lighting franchise asked by the Nogales Electric Light, Ice & Water Company, and call an election at once to submit it to the people.

REDWOOD CITY, CAL.—Judge B. V. Sargent of Monterey County, sitting for Judge George H. Buck, gave the county judgment against the Spring Valley Water Company

in an action brought by the county to compel the water company to remove its flume, which runs through the main street of San Bruno, six feet above the ground. District Attorney Swart, who represented the county, contended that it was a nuisance, while the attorneys for the water company argued that its right of way had been obtained before the street became a public highway.

FRESNO, CAL.—An arrangement has been tentatively agreed upon to cancel the $45,600 contract for the installation of the down town electrolier lighting system and substitute for it another under a new call for bids. This agreement has been entered into between City Attorney Lewis H. Smith for the city and S. V. McKenny of Los Angeles for the contractors of Seattle, Wash.

SALT LAKE CITY, UTAH.—By a decision of the State Supreme Court in an opinion handed down last week, the ordinance passed by the city council of Salt Lake City four years ago levying an annual license tax of $1.00 against each meter in use by the Utah Light & Railway Company is held to be invalid on the ground that it is not uniform in its application, the company having previously declined to comply with it. The right of the city to pass an ordinance requiring such a license fee is upheld by the supreme court and it is announced that the matter of passing an amended ordinance to meet the requirements of the Supreme Court's decision will be laid before the city commission in the immediate future.

TRANSMISSION.

CORVALLIS, ORE.—Lightning set fire to a generator in the Oregon Power Company's substation causing a loss of $2500.

PE ELL, WASH.—The Central Light & Power Company, Centralia, are making arrangements for the construction of a new dam here to cost $18,000.

WENATCHEE, WASH.—The city council has denied the application of the Cashmere Water Power Company for a franchise in the city for a second electric plant.

EDMONDS, WASH.—The Edmonds Light & Power Company has been granted a franchise for the extension of lines in and around Edmonds by the county commissioners of Everett.

PORTLAND, ORE.—A contract for building an electric cable line from Sandy to the Bull Run power plant, has been awarded by the Portland Railway, Light & Power Company to F. L. Mack.

RAYMOND, WASH.—The Willapa Harbor Power Company of South Bend has been granted a franchise to erect poles, string wires and distribute power throughout several townships in Pacific county.

FRESNO, CAL.—The San Joaquin Light & Power Company's two high power transmission lines from Plant No. 1 on the San Joaquin River have been fully repaired since the damage done by the recent forest fire.

HOOD RIVER, ORE.—August Guigard has completed filings with the State Engineer at Salem for the development of 2000 h.p. on Hood River for the establishment of a general electric plant to supply farmers in the vicinity.

SEATTLE, WASH.—At a meeting of the council held during the early part of last week, President Haas introduced an ordinance, requiring all telegraph, telephone and other electric wires to be placed underground, so that private corporations shall not be subject to the penalties for failure to observe this regulation until the city also complies with its terms. It is said that the city has been lax in placing its wires underground while the private corporations have obeyed its terms.

TRANSPORTATION.

SANTA ROSA, CAL.—Sealed bids will be received up to September 10th for the street railroad franchise petitioned for by A. D. Bowen.

EXETER, CAL.—A two mile extension to the Visalia Electric Railroads is to be built at once running from Rose Station to Elderwood.

ALAMEDA, CAL.—City Attorney Samuel Poorman Jr. has been ordered to prepare statistics in the suit of the Oakland & San Francisco Terminal Railways against the city of Alameda to nullify the half-fare ordinance.

BOZEMAN, MONT.—Eugene W. Dawes, Bozeman, is promoting an electric line to traverse Madison and Gallatin valleys, connecting with the Milwaukee and Northern Pacific roads at Bozeman and running west to Yellowstone to connect with the Oregon Short line, a total distance of 150 miles.

CLOVIS, CAL.—In the re-sale of the franchise to construct a street and interurban railroad along the public streets and avenues in this city, bids will be received up to September 1st. The Fresno Interurban Railway Company has presented its application to the trustees for the franchise.

SEATTLE, WASH.—With a view to the abandonment of all proposed extensions to the municipal car lines and the establishment of automobile systems for the carrying of passengers and freight instead, Councilman Erickson, municipal ownership advocate, has introduced a bill, the object of which is to regulate the use and operation of such vehicles.

OAKLAND, CAL.—Announcement has been made that the through train on the Northern Electric and Oakland, Antioch & Eastern Railroad, taken off three months ago, will be put on again soon. The train will leave Chico at 6:20 a. m., reaching Sacramento at 9:00 a. m., and arriving in Oakland at 12:15 p. m. The train will leave Cakland at 5 p. m. and arrive in Chico at 10:35 p. m.

FRESNO, CAL.—Work on the second unit of the Fresno Interurban is scheduled to begin in about ten days, according to Manager R. J. Kelley. The precise date depends upon the arrival of materials and whether or not the company secures the franchise through Clovis that it desires. The trustees of Clovis have passed the ordinance offering a franchise for sale. The franchise, on August 10 will be offered for sale to the highest bidder.

SEATTLE, WASH.—At a council meeting held during the later part of last week an ordinance was introduced amending the private street railway franchise in the south of the city known as the Jackson Street Loop, or Main street line, so that the city may obtain common user rights for its municipal lines. The original franchise was granted in October, 1891, the city reserving at that time the right to amend it. If these common user rights are as it is anticipated, readily secured, the city expects to extend the Lake Burien line from its present terminus in West Seattle to the downtown passenger stations.

SPOKANE, WASH.—The connection of the Washington Water Power Company and the Spokane Traction Company on Boone avenue, by which the Hillyard cars of the Water Power Company will again run north on Hamilton street, from Boone avenue, will begin as soon as the Trent avenue, franchise, which has been delayed from time to time by the council, is passed by them and accepted by the company. Under the settlement now said to. have been agreed upon, the Washington Water Power Company is to build the new tracks for the Inland on Trent avenue from Market to Sheridan streets and is also to make the connection on Boone avenue. Steam roads and the city also contribute towards the expense.

SAN JOSE, CAL.—Manager Frank E. Chapin of the Peninsular Electric Company is consulting with Paul Shoup, head of the Southern Pacific Company's electric subsidiaries as to the advisability of abandoning several miles of their electric system between here and Los Gatos by way of Campbell, and also the Saratoga and Congress Spring lines. In the event of these changes, it is stated, the present steam line between San Jose and Los Gatos by way of Vasona Junction and Campbell will be electrified. It is stated that some radical changes are necessary of an enormous shrinkage in the profits of the company, due to the increasing use of the automobile. The enormous number of paying projects going on in San Jose and in outside towns also has been a big financial drain on the Peninsular company.

TELEPHONE AND TELEGRAPH.

SAN BERNARDINO, CAL.—Manager A. E. Scott of the Pacific Telephone & Telegraph Company has announced that the company has authorized $12,000 for extensions in this city.

BURBANK, CAL.—At a meeting of the board of trustees Arthur Campbell, manager of the San Fernando Valley Home Telephone Company, asked the privilege for his company to construct poles for service on Third street, claiming a franchise before the incorporation of the city.

WHITTIER, CAL.—Improvements and additional equipment to cost about $10,000, have been announced by A. Wardman, manager of the Whittier Home Telephone Company. Part of the equipment is already on hand, and installation will begin at once.

WINNEMUCCA, NEV.—The application of the Bell Telephone Company to construct its line through the county, coming into Winnemucca along the right of way of the Southern Pacific and leaving via the Western Pacific will be heard at the September meeting of the county commissioners.

LOS ANGELES, CAL.—Preparatory to installing a new fire alarm and police signal system, plans have been prepared for such a system under the supervision of the fire alarm commission. City Electrician Manahan will soon report to the city council so that the council may advertise for bids. The sum of $200,000 has been appropriated for this work.

TACOMA, WASH.—Charging the Pacific Telephone & Telegraph Company, the Sundel Telephone Company and subsidiary corncerns in Washington and Oregon with combining in violation of the interstate laws to put the Northwestern Long Distance Telephone Company of Los Angeles out of business and destroy competition, John B. Coffey, receiver of the Northwestern has filed suit in the Tacoma Federal Court for $300,000 damages.

SAN DIEGO, CAL.—Manager J. E. Franklin of the Pacific Telephone & Telegraph Company, has announced that his company has authorized the expenditure of $72,000 in extensions and improvements in San Diego service. Additional work on the Hillcrest exchange to cost $37,000 is included in the plans and $21,000 is being expended on a cable to Point Lomas at the present time.

BERKELEY, CAL.—Litigation extending over a period of three years in which the city of Berkeley sought to enjoin the merger of the Home Telephone Company with the Pacific States Telephone & Telegraph Company, was tentatively ended a few days ago when the municipal authorities entered into an agreement of compromise whereby the city is to receive $30,000 and the free use of 75 telephones. The sum agreed on in compromise will be paid to Berkeley on the installment plan, at the rate of 2 per cent of the annual gross receipts, an average of which is represented in last year's total of $300,000. By the terms of the agreement, Berkeley will relinquish proceedings to recover the $25,000 bond forfeiture of the Home company. The negotiations concluded grew out of the absorption of the Home company by the Pacific two and a half years ago, the former company being granted a 50 year franchise in Berkeley in 1907, for which it paid $47,000.

WATERWORKS.

LOVELOCK, NEV.—L. H. Taylor has been granted a franchise to construct and operate a water system here.

ESCONDIDO, CAL.—The directors of the Escondido Mutual Water Company are considering bids for machinery for two big water power plants to be constructed shortly. Excavation is completed and pipe line construction started.

GLENDORA, CAL.—An ordinance has been prepared calling a special election September 10th for the purpose of submitting to the voters the question of incurring a bonded indebtedness in the sum of $37,500 for the construction of a municipal water plant.

LOS ANGELES, CAL.—Negotiations for the purchase of the Union Hollywood Water Company's system have encountered obstacles, the outlook now being that Wm. Mulholland's recommendation that the city lay a new system duplicating the Union Hollywood's, may be followed.

SEATTLE, WASH.—Bids will be received until September 7th for the construction of certain additions to the water system of Toppenish, Wash., which will consist of erecting a tank of 75,000 gallons capacity at a height of 105 feet above the ground and the laying of 15,000 feet of cast iron water mains.

ASHLAND, ORE.—The city has authorized the printing of the auxiliary water bonds in the sum of $175,000 and a special committee of that body has been given power to attend to any necessary details connected with the issue of the same, in order that the legality of the bonds may be beyond controversy.

VAN NUYS, CAL.—Plans and estimates for a distributing system are ready to be presented to the county supervisors, to have an election called for the purpose of forming a district and voting bonds to share the cost of the system. Wm. Mulholland of Los Angeles prepared the plans. A trunk line along the county highway through Cahuenga pass to Hollywood, has been added to the district which will be served.

SAN FRANCISCO, CAL.—The Works Board is about to purchase more pipe for the high pressure fire protection system. The U. S. Castiron Pipe & Foundry Company has filed a bid offering to supply what is needed at $26 per ton of 2000 lbs. f.o.b. at point of manufacture. The city has in the corporation yard between 20 and 30 miles of unused high pressure pipe of smaller size than the pipe laid down town. The plan was to use it for outer residential districts. The pipe to be ordered will duplicate the larger sizes now installed, the city officials proposing to have it ready in case of a break. The pipe on hand cannot be used for replacing broken sections, being too small.

SAN FRANCISCO, CAL.—On the annual tour of inspection, made over the Spring Valley Water Company's properties, the board of health went at considerable length into the question of possible pollution of artesian water in the Pleasanton district, should the water company carry out its proposed plan and withhold for realty development the area under which the subterranean streams flow. The trip included a visit to Dumbarton and a tour of the lakes. Crystal Springs, San Andreas and Pilarcitos, with a stop at the Crystal Springs cottage. The party visited Sunol, Pleasanton and the great Calaveras dam, now partially completed, where, when finished, 63,000,000,000 gallons of water will be impounded. At all the sources of water samples were taken for analysis.

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